DOCUMENT RESUME

ED 181 880 IR 007 895

AUTHOR Malik, M. F.
TITLE Aesthetical Information Impact of Artworks on the Human Mind.
PUB DATE Dec 78
NOTE 63p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Aesthetic Education; Art; Art Appreciation; Cognitive Development; *Cognitive Processes; Media Research; *Neurological Organization; *Perception; Physiology; Psychological Studies
IDENTIFIERS *Aesthetics; *Biocybernetics

ABSTRACT

The major areas of concern in this paper are the information and aesthetical impacts of artwork on the human mind, and the modes, structures, and media of artwork which influence the formulation of aesthetical impact. The analysis of aesthetical information impact follows current discoveries in the disciplines of biocybernetics, system and information theories, and neuro- and psycho-physiology. Phases of the mental process which can influence the notion of aesthetical impact are examined, and it is noted that this impact may have its origin in one or all three major parts of the information chain--the artwork itself, the environment in which the artwork is intercepted, and/or the viewer (observer) and his or her past experiences, memories, or systems of thinking. Also explored are the differences in the process of aesthetical impact formulation from different kinds of artwork, i.e., pictures, books, music, film, or television programs; differences caused by different modes of delivery, e.g., direct experience (book), performance (theater), or substituted transmission (television); and differences arising from the structure of the artwork itself. The creation of an aesthetical profile of artworks, regions, or audiences is briefly discussed and a proposal for research in this area is outlined. A bibliography is attached. (RAO)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED181880

Dr. M.F. Malik

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

AESTHETICAL INFORMATION IMPACT OF ARTWORKS ON THE HUMAN MIND

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
M.F. Malik

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

December 1978

IR007895

INDEX

I. Information Impact of Artwork on the Human Mind 1

II. Aesthetical Impact of Artwork on the Human Mind 13

III. Artwork's Modes, Structures and Media, as Reflected by the Human Mind 23

- Visual Mode: Reading of Pictures 23
  Reading of Graphics 27
  Reading of Text, Book, Letters 29
- Aural Mode: Listening to Sound 32
  Listening to Speech 33
  Listening to Music 34
- Audio-Visual Mode 37
- Spatial Mode 40

IV. Artwork's Means of Delivery, Affecting the Formulation of Aesthetical Impacts 44

V. Artwork's Structures, Affecting the Formulation of Aesthetical Impacts 48

VI. Aesthetical Profile 53

VII. Bibliography 54

AESTHETICAL INFORMATION IMPACT OF ARTWORKS ON THE HUMAN MIND

In this field my main concern has been within three major fields and analysis of them:

1. Information Impact of Artwork on the Human Mind
2. Aesthetical Impact of Artwork of the Human Mind
3. Artwork Modes, Structures and Media, influencing the formulation of aesthetical impact on the human mind.

The attempt of Aesthetical Information Impact analysis follows current discoveries in the disiplines of biocybernetics, system and information theories, neuro- and psycho-physiology.

I. INFORMATION IMPACT OF ARTWORK ON THE HUMAN MIND

Basically, here information is understood not in the obvious narrow sense (memorized, stored cognitive or formal unit), but in the broader sense of any neural energetic change with catalytic character. In this sense, information is a basic component of every artwork - as in painting, sculpture, a piece of literature, a theatrical play, a film or television programme. This definition is related to information within the artwork with any information in a highly functional or metabolic process, existing between plants, minerals and animals.

In the human world, information processes have a specific structure called an information chain. In a simple scheme, it has three parts:

Information source (painting, sculpture, film, ballet performance);

Transmission conditions (place and time in which the artwork is perceived, like a reader's room, exhibition space, cinema-theatre, auditorium);

Receiver and his response (people perceiving artworks individually or collectively, viewers, TV watchers).

If any part of the information chain is changed, the information itself is (slightly or profoundly) changed.

For a long time it was believed that an information source contained all the aesthetic information impact itself, and that nothing could change it. Now we know that the information source (artwork) carries only a certain amount

(high or low) of information, most capable in starting the catalytic process. There are accidental (stone, mountain, cloud, animal) and man-made (painting, architectural piece, dramatic play) structures, which can act as information sources. Also, these structures may have different functional (logistic), perceptual or stress characteristics, reflected in human behaviour, latent or pronounced.

Transmission conditions (reader's room, exhibition space, auditorium, or in a broader sense, any perceptual environment) were believed only to be a passive pipe through which the content of the artwork was delivered to people's senses. This is only partially true, and specifically when transmission of information from artwork to receiver happens very quickly, immediately. If perception of artwork is dispersed over time and space (of several generations, several cultures), the content of information source may be perceived differently. Repeated exposures of similar contents or forms very often form stylistic, cognitive or formal stereotypes and archetypes, specific for cultures, centuries or transmission medium.

The receiver (viewer, audience in theatre, reader, listener of concepts) was believed to be a consumer of the information source. This is far from the truth. An information source (sculpture, film, theatre play) is never physically consumed; it is perceived by the human minds of the audience. This perception can lead, but not necessarily, to the comparative information processing and retention in the human brain. A quantity of information, its structure or succession perceived is not the same as in the information source, and can be, and in most cases is, diametrally different. By retention, only part of the information quantity is actually stored in the human memory (we remember only certain parts of a theatre play, certain parts of a painted picture, certain shots of a television programme).

By the processing and storing of information in (the viewer's) brain, other processes occur which the incoming information starts as a catalyst. Usually, incoming information from artworks act as catalysts to other mental processes which occur due to the processing and storing of information in the viewer's brain. In this sense, we witness the information impact which can provoke the receiver's response, either a latent one (i.e. thinking of a painting, sculpture), ore pronounced, behaved one (talking about the artwork, interest in similar artworks, subsequent visits to galleries, reading about ...). The response may also begin in another information chain.

Information chains of artworks exist in a certain time and space. There is a production time, transmission time and perceptual time of any artwork. Both production and perception time contain a high amount of meta-information processing (thoughts of the artist before the creation of artwork, thoughts of perceiver, viewer during the perception of artwork, thoughts and imaginations of readers after reading a book), transmission time is the actual amount of time which is needed in order of the performance of the artwork to the viewer, listener.

Artwork may be perceived as an information cascade, in which overlaps of information are processed. One kind of information cascade is typified by the perceiver's freedom in processing information at his own pace and with his own selectivity (e.g. an art gallery, reading a book or magazine); this I refer to as a horizontal, structural cascade. In another kind of information cascade, there are fixed and programmed successions of time for the perception of specific pieces of information (e.g. a film or television programme, a theatrical presentation, a concert); this I refer to as a vertical, linear cascade.

High overlaps are typical for vertical information cascades, and these overlaps are multi-layered (the perception of artwork can be overlapped with another physical or mental activity - during the gallery visit or reading a book, watching TV programme), and dispersed over segments of time (repeated visit or viewing of a picture, interrupted reading of a book over a period of several days).

The prevailing mode of perception may influence indirectly both sorts of information cascades (when the information environment contains a high amount of perceived films, TV programmes, the book is read differently than when a person lives in a slower information environment of solitary rural space).

In older times, it was believed that the transmission and perceptual times should be identical. Even if it seems to be in common understanding in human communications mode, it is not. The newer biometrical studies show the differences within the seconds range. This is not critical for the horizontal cascade (book, painting), but it is important for the vertical cascade (film, television, music).

Important geneological and histollogical phenomena exist in the area of perceptual time. For every human being, perception occurs at different rates and in different manners, from one object or event to another. And

across time, perceptual time has changed for each culture. During human life, a person perceives everything with different speed and manner (young or old reader, viewer). Also, during the centuries, the perceptual time has changed. People in the fourteenth, eighteenth, and our twentieth century perceive their worlds with different speeds and manners. In contemporary time, the speed of perception - especially in America and Europe - is the fastest our civilization has ever known. While this would not mean that all information which is perceived is duly processed and stored, it does suggest that we are living more than one biological perceptual life. And perhaps this fact is one of the underlying reasons for what has been called "the generation gap"; no wonder a son complains that his father cannot understand the young conception of life and ideas, especially if the father is in the manner of information interception, processing and storage of the son's great-grandfather!

If we know the perceiver's way of information processing and storages, the complex of all his habits and approaches toward the processes, we can call it the perceptual spectrum of audience.

The perceptual spectrum of audience varies with time and space. The human environment, culture and history (traditions) greatly influence the way people perceive the world. Similar environments,cultures, traditions can group individual perceptual stereotypes into a common way of perceiving - we sometimes refer to this as the tastes of the audience, mixing the preferences for perception of artworks with value judgments and discriminations.

This process is basic for the development of communication in all mankind. In tribal societies, man had fixed only a few information stereotypes (ways of communication during the hunting, tool production, rituals). The first civilizations arose with a high fixation of stereotypes (language, alphabet, systems of commerce and money, government). In contemporary society, we witness diversification of stereotyped codes, as well as the process of diversification of audience. During certain times or centuries in the history of civilization, we can find greatly unified stereotypes or "average viewers, readers". This usually coincides with unified codes of artistic expressions (styles).

Our time is typical in the lack of both. Very small groups of audience differ in the habits of perception of artworks, and opinions regarding or reflections of it. In this area, we are dealing with "multi-layered receivers", each layer with a different specification of content, time, and place of perception. Even technologically unified modes of transmission (like film, television, radio) sense this process of diversification of audience.

When the receiver of an artwork has diversified, multi-layered characteristics, it becomes difficult or impossible to maintain the unity of the content or form of the artwork. The same information source is understood quite differently in different places or different groups of people (exhibition "Treasures of Tutankhamun" in Los Angeles and Peking). The logistic understanding of artwork (what the story or theme of the artwork is about) becomes less meaningful for people with different perceptual stereotypes and spectrums. Sometimes, opposite values are attached to the same content by different people (ballet television production aired for Montreal audience and at the same time for Eskimo audience in Northern Canada).

Geneologically, the medium of artwork attracts receivers (especially when the new medium is being introduced to the culture, e.g. television) by the external formal parts, as carriers of information impact. When the receiver becomes used to the medium, the semantic parts of information (the content of the show) becomes most important. In the final stage, when these semantic parts are easily understood, and the culture has become adjusted to the medium, concentration may then begin on the aesthetic function of the artistic medium, i.e. the internal formal parts of the experience.

Sensoric information is processed in the human body by the brain which is composed of approximately a hundred billion cells. These cells are of two kinds: neurons which are the functional units; and glia which are filters of space but which have specific functions at certain times of brain activity. Each neuron has a cell body and connections called axons and dendrites (incoming and outgoing fibers). Between these bodies, and also between these connections, there are liquid gates called synapses in which the transfer of chemical and electrical activities are combined.

The number of neurons are more or less loosely inter-connected. The electrochemical activity of such neurons is called neuron circuit (which is of a temporary nature), and a neuron circuit is the basic unit for information processing in the human brain. The interrelated activity of neuron circuits is what is commonly referred to as "thinking". During this procedure, more can happen than mere energy transfer: the chemical properties of synaptic gates

or neuron cell bodies are slightly changed. Thse changes, which are more or less permanent, are the base of human memory. If the change occurs on the level of the synapsis or glia, a lower level of information unit can be stored. If, however, the change occurs in the cell bodies of a large area (a memory complex), then we store information patterns which, in turn, are capable of starting or influencing many future information transfers (ways of thinking). If the chemical change is durable and capable of influencing other parts of the brain on a similar level, then we are dealing with high stereotypes or skills. This process is close to our codes of "learning". If a whole structure of more or less permanent interconnected neuron circuits is created, we label this feature "temporal neural pathway", which is the basic unit for the processing and storing of semantic information unit ("thought", "idea"). The borderline of such pathways create a resistance pattern in feedback to this process, which may direct future excitations or decays of pathways (our notion of "value").

A single neuron circuit is not capable of processing such complex notions as a "tree" or "house". Instead, a multitude of neuron circuits are in operation, not only at the very moment when a person sees a tree, but also shortly thereafter, and the final fixation of memory is finished long after, within hours after the moment of perception. If a person receives several information units during a short time, neuron circuits may start to anticipate the further information impact before the actual input is received. When several neuron circuits are activitated from the sensoric input, the inner feedback mechanism not only further specifies the sensoric target (e.g. movement of the eye), but is also builds a very specific hierarchy of activities within the brain; therefore from the perception process, certain neuron circuits are left with higher energy potential than others. Energy transfer, then, is the transmission medium in the brain, and the sensitivity of neuron circuits represent the primary gate through which the transfer may or may not occur. The neuron circuits have a certain minimal energy level which can be increased or decreased metabolically or mentally. This "sensitivity" can also be changed due to the sensoric input causing later chemical changes.

There are basically two mechanisms of neural transfer in the human brain:

(1) Specific Transfer, where intensity of the incoming energy and characteristics (e.g. amplitude and time) determine the energy transfer. Usually, such transfers result in excitation and threshold changes of small groups of circuits within the cortical (and, rarely, the subcortical) regions of

the brain. They propagate with high energy potentials through the neocortex, but may not excite the circuits with every different thresholds. Areas of the brain cortex within the parental lobes are likely to be influenced by such transfers. In such cases, the person refers to "rational thinking", "reasoning". This process is only faintly detectable on EEG records.

(2) Wave transfer: With certain sensoric or metabolic inputs, the incoming energy (of large volumes) can act as a catalyst for an avalanche of activities of many neuron circuits, regardless of their thresholds, but dependent on the proximity of the cortical (and often also the subcortical) regions. In such cases, the person reports "emotions", "feelings", "thinking by heart".

A combination of both mechanisms, which often occur in everyday life may bring certain mental stress to the person, but they do not yet constitute "aesthetical feelings". The processing, storage, and, namely, the reflection (feedback) of such processes back to the cortex make up the psychophysiological basis for what we refer to as "aesthetical feeling", or, in special cases, also notions of creativity, enlightenment, trance.

The combination of mechanisms does not occur often or easily. Usually, when the cortex is in the state of wave transfer, the intensive specific transfer is subdued. On the other hand, if a person employs specific transfer predominantly (rational thinking), subcortical activities are subdued.

Certain persons may have an inclination to certain modes of transfer. There is a difference between the sexes: women produce wave transfers more easily, or employ more subcortical regions of the brain during their lives. Men are commonly known to suffer earlier from deficiencies of specific transfers (senility) in old age. There are also certain differences in the combination of both mechanisms due to racial and cultural differences.

When input from sensors activates the neuron circuit, the information part is not only registered or retrieved, but something else remains in the human brain: any electrical activity slighly changes the substance made or reacted to by the cell. There are organic substances that are more susceptive toward electrical activity than others. In certain chemical configurations, this transfer may occur quickly or slowly, or not at all. The base of human

memory is probably a chemical one. The time axis in the human memory bears energetic characteristics.

The memory is not specific only to the human brain. There are other cells in our body which are capable of "memorizing" (genetical, immunological memory, etc.). What is specific to the brain memory is that the chemo-electrical retrieval is compressed in an unbelievable quantity and speed - both of which are capable of changing the stored information to an unkown extent.

There are three levels of memory in the human brain and sensors alike. The first level is the primary sensoric memory, or input memory: the human being has refined his sensors toward the results (oncoming signal) and not toward the input function. This memory is in action, when the human eye reads certain parts of a picture, a letter in printed work, one invisible frame of film.

The second level of memory is a short-term memory, or a primary capacity of neuron circuits. (This permits us to remember something like a telephone number just long enough to dial it). Such memory does not extend further than a time of 20-40 seconds, but depending on our daily usuage of this memory, time or quanity of bits stored can be extended manifold). The higher, more permanent storage is long-term memory. This memory results within minutes or hours from the moment of input, but can be still easily erased or interrupted (electrically, chemo-therapeutically or psychoanalytically). The build-up of such memory largely depends on the chemical properties present in the brain and in the body at that time. There is another, "more-than-long" semantic term memory (which builds in the brain), with features called temporal neural pathways - and this regulates a person's attitudes, values, judgments, moral, ethical codes of thinking, and (occasionally) behaviour.

The short term memory is characterized by high electrical activity in the neuron circuit. The long-term memory shows up in electrical measurements long latent electrical phase, but by retrieval, the response can burst out in high intensity.

The "semantic" memory is characterized not by electrical activity, but by the "resistance fields" which set "barriers" to the specific and wave transfers of incoming energies.

The human memory is not a fixed energetic state of the human brain, but it is a fluent energetic process, which is built, is in existence, and fails, as our memories are built and fail. Chemical properties build up

during the period of input fixation can last or range to a much greater extent than the initial input (memory residua: imagination, dreams - as unconscious ones; forecasts - as conscious ones). It can also influence hypothalamic processes and far off, non-related parts of the brain or body (associative memory).

The perception of artwork always occurs in some time period, as a repeated process (page after page of a book, one look after another of a picture or sculpture, segment after segment of theatre play or concert).

The time base of an artwork must somehow correspond to the time base of receivers, otherwise startling change of the understanding, emotional or aesthetical impact of artwork occurs. (For example, when the theme of a theatre play is presented too slowly, the small, sometimes unimportant formal details of scenery or actors' genstures become important carriers of messages or styles; when the same theme is presented in a comfortable speed for perception, semantic characteristics of a story or theme are perceived; when the same theme is presented too quickly (much faster than average perceptual speed), the content or messages can become unimportant, leaving only external formal parts as carriers of impact).

But what is the "right time base" for the performance of artworks"? There are several basic facts which influence the "time base" in all perceptual processes:

1. The basic (metabolic) perceptual rhythm:

The human neural system has periods of high operational sensitivity, and periods, where due to the metabolic changes, the functions of systems or channels are slightly subdued. This occurs (with great deviation due to age, physical activities or imposed neural activities and stresses), approximately twice per minute. Children can have three or more periods, older people can have one or less than one period per minute.

2. The imposed perceptual rhythm:

The previously mentioned basic rhythm can be modulated due to the input of information from the information source or environment. The artwork (artist) can quicken or slow down the natural rhythm to a great extent. But to to this, a certain time always elapses (several minutes). To accommodate

a person on a certain unusual perceptual rhythm, it takes more than 10- 15 minutes for a single sensoric channel (hence the "overtures" in operas); for multiple channel delivery 2 - 5 minutes (teasers for televsion programmes, or the "title song" of a film). To change the imposed rhythm takes a much shorter time, as the viewer adjusts to "flow with" the programme, but it always takes more than one period of basic perceptual rhythm.

3. The stress (oscilated) perceptual rhythm:

When using catalysts in artwork, creating stress waves (emotional impacts), it can happen that the perceptual rhythm begins to be irregular, with returning irregularities during short periods. This creates a "bouncing" pattern, where the receiver fills the space with non-existent stimuli from his own imagination (meta-subliminal effect).
The perceptual rhythm actually changes the information source (artwork) in the perceiver's mind, without actually changing anything in the artwork (painting, sculpture, film, book). For example, if information (dialogue, action) is placed in a high sensitivity period, the presented idea, content, will be amplified in the viewer's mind. If it is placed in a low sensitivity period, the same idea or conent may be subdued, no matter how generally or artistically this information is.

When the informational environment supplies the person with a lot of information in a short time, people begin to join them together. This situation can not only happen in city streets overfilled with neon signs, but also in a museum gallery with many pictures or artifacts observed successively, or with a book overfilled with descriptions of situations or many characters in action.

This joint information dialectically becomes of a new quality, and may have different content, form, and aesthetic impact. We call large amounts of such joint information information patterns.

(For example, you are driving on a highway at a low speed through a suburban town - you can distinguish every house. At high speed, you perceive the same experience as a housing entity. You are now unable to perceive certain features. One of these houses has a tower, which you consider ugly. When driving through at high speed, you may retain the memory of only this exceptionally ugly tower, skimming over many nice features of houses without any retention. Similarly, this can occur to a certain extent in walking through

an overfilled picture gallery, or by perceiving television programmes where certain shots have a very positive value, but the audience skims over them and retains only negative details because of the position in successive speed. The information pattern of a country, of a car, of women, and many others are also developing over time. With time, this pattern remains in the human memory, the specific parts of the pattern decay, leaving only the indispensible features of it. The simplified pattern is called "perceptual stereotype". For evolving such a stereotype, a minimal amount of distinguishing signs are necessary, and a minimal amount of energy in the cortical neural system is used. Therefore, it becomes an "easy and comfortable way" of thinking and dealing with the informational environment (hence the great preference for stereotyped situation comedies in television). But in the same way, it becomes an important tool for the effectiveness of thinking and is often implemented by artists into artwork (for example, in oval stones we can distinguish a human face, in a tree during a fog, a human posture, in a black dot on a highway, an automobile). Perceptual stereotype is, of course, still far from an "aesthetical stereotype".

When many information patterns exist in daily life, less individual content of their parts is perceived or stored in the memory. When several perceptual generations live in the same biological time, as in our time, this process can be viewed as shallowing of previous ideas, content, styles, themes. Therefore, it introduces the notion of a whole artistic field, media, which permits an easy information pattern transfer (television) and builds certain resistances toward media with low information pattern transfer (books).

When the information pattern is used for a longer time and is successfull in communication between people, it becoems a symbol. There is a particular way of identification, fixation and perception of symbols.

From the neurophysiological point of view, the formal and semantic parts of information are not processed in the brain very differently or on different places of the cortex. Usually, the information input from sensors carry formal and semantic parameters in the same time, simultaneously, and the division of such components may, or in many cases, may not happen.

It is a predominant function of the upper cortical regions to reprocess incoming signals from the cerebellum (sometimes at a very high speed, where we cannot label this process as real "feedback") before the first memory storages are attempted. The occasional by-product of reprocessing may be reflected, and in this reflection, we differentiate the "form" and "content" of the artwork. Even the very highly developed human brain may often have difficulty making such distinctions. The long repeated sensoric input followed closely by abstractions may be needed in order to learn a greater ability for formal or semantic analysis of the artworks. Usually, semantic analysis may be a simpler task; the simpler it is, the more the story, content of the artwork reflects the environmental realities of the observer. For formal analysis, there are no direct connections between the viewer's environment and his/her ability to distinguish the form or style of the artwork. Therefore, artifical learning is a necessity.

The analytic ability of the brain's cortex has not yet yielded the notion of "aesthetical impact".

It should be noted that the semantic part of information may act independently of the perceived artwork in the receiver's mind. In this case the artwork is a catalyst, or motivation unit, remembering the observer of a certain content, which is further developed under the power and conditions of the receiver's mind depending on past experiences and memory storages exclusively, leaving the artwork's content without any significant storages.

The same cannot be said about the independent acting or formal parts of the information source. There is an indirect impact of perceived and stored forms: they act as builders of "borderline resistance" around temporal neural pathways, and in a longer range, may be responsible for higher abstracts pertinent to the judgment of artistic values of a piece (notion of symmetry, colour balance, contrasts, etc.) This indirect impact can be subconscious or conscious.

II. THE AESTHETICAL IMPACT OF ARTWORK ON THE HUMAN MIND

There is a general uneasiness among biocybernetists or neurophysiologists, in defining the notion of "aesthetics". This caution derives from the fact that what is easily labelled in one word (although we may differ in opinion in what this word means), is a complicated, structured process in the human brain - in some cases coinciding with the word aesthetics - but in many other cases has very little resemblance with known speculative aesthetical theories, and has connections with other mental or metabolic processes.

Here are some phases of the mental process, which can influence the notion of "aesthetical impact":

1. There is no significant distinction on the sensoric level of incoming information between "aesthetic" and "non-aesthetic" information. Eyes scan painted artistic pictures or functional details of machine in a similar mode at first. Ears hear an unpleasant sound and harmonic chord similarly. This similarity extends only to the microsecond range. Very early, by repeated process of reading the picture or words, or hearing the sound, a person applies a multitude of different feedback searches specific to the perception of the artwork. The major importance, here, is the binary aspect of perception.

2. Recent research shows that there is little difference in the activity of cerebral cortex, when incoming signals from sensors are first processed in the brain. The cerebral cortex interacts or feedbacks only major physiological parameters of the artwork (spectral changes of sound, color, geometry of space, differences in brightness and contrast, as well as typography of text and spacing information within the paragraph or on a page of a book). But here the artist has the first chance to significantly influence the delivery of the artwork's content, message. By composition of picture, musical piece, syntax of book story, the succession of incoming information into the brain is more or less programmed in time, and in this way, further abstractions, processing of information and memory storages can be significantly influenced. Most "formists" among aestheticians pay attention to this part of the artwork perception process (Arnheim, Zettl) and describe the functions of formal parts of artworks on the human mind in great detail. But the actual impact of the artwork goes much further than to the function of the brain's cerebral cortex.

3. The processing characteristics of the artwork vary significantly from the processing of functional information parts. At first, there is usually a rich combination of stresswave and specific transfers. This combination may have a very different time base and space configurations in the cortex. (1) It may start as stresswaves in the cortical level and fire specifically in the subcortical region (sometimes evoking motor responses, like laughter, blushing, movement of head, eyes, etc.); (2) It may start from the subcortical region andgo to the cortical region with great delay (in cases when the artwork employs pieces of reality, the receiver should act upon - like architectural piece, landscape, dance); (3) It may be processed for a relatively long time (of several microseconds) exclusively on the specific firing base of the cortex, and then from short-term memory, causing stresswaves in the cortical or subcortical regions.

Secondly, there is usually a high number of feedback searches: the person returns to the initial sensoric input many more times than the usual functional information processing (eye scan painting more times than a similar piece of reality, ears heighten the sensitivity toward small spectral changes of a tune), and these feedbacks should usually yield more new information (if the observer is not getting enough information input from subsequent searches, usually reports regarding the artwork as "dull", "cheap", "nothing in it", "not rich"...).

Thirdly, there is usually a very high activity of non-related cortical regions in subsequent time, especially when the first memory searches become apparent on the EEG record. We may suspect that the person is completing the artwork's perceptual input from his/her own memories, experiences, comparisons.

It should be clearly understood that although the final neural pathway ("idea", "form of artwork") may be formed in certain parts of the brain's cortex, - during the processing of information also - other, unrelated parts of the brain are active.

The notion that pictures are processed on the right and words on the left hemispheres of the brain is only partially true. We only know that words or speech must yield activity on the left brain hemisphere, and whenever a picture with spacial components are perceived, the right hemisphere is surely active. The final fixations in memory can overlap in very different regions of the brain, and retrieval may not only employ the mentioned single hemisphere, but the whole brain's cortex.

4. Somewhere between the processing of information form the perceived artwork and long-term memory storage, a process we may associate with "aesthetic" notion occurs.

By processing of information in the cortex, not only is the incoming information energy active, but also the inner part of the cortex, which is in a state of constant action (during waking hours). The reflection of the processed information from the artwork on the remaining certain part of the cortex are a source of "aesthetic" notion. Recent research shows that this "certain part" of the cortex is very often in the frontal area of the brain, parental lobe. Generally, it is believed that the major function of the cortical area in the parental lobes is one of combinatory thinking (when a person is involved in mathematical games, chess playing or counting - high activity in the cortical regions of parental lobes are quickly erupting and ceasing). By the functional disruptions of this area (due to accidents), a person loses most of his ability to judge or reason, also the ability to distinguish between "beautiful" and "ugly". But we should not localize the "aesthetical spot" on the brain's cortex in an Aristotelian way - the parental lobe region is only one of the necessary mechanisms for acknowledging the "aesthetical value" of the artwork. Without the preceding processing or input characteristic the speculative action of the parental lobe may not yield any notion of aesthetical character.

Basically, this part of the neural process is similar to the rational abstract thinking, but works with neural energy material of a very different character (predominantly fusions of stresswaves and specific firings of neuron circuits). This is the reason why "aesthetics" is sometimes labelled as the "science of art" or the "science of beauty".

5. There is a certain "by-product" of "aesthetical acknowledging" of the stored information in long-term memory. When information is stored (chemically), there remains a certain lowered threshold characteristics on the number of neuron circuits, giving the possibility for further similar signals to pass faster and easier through the cortex of the brain. The surrounding circuits, in opposition, create the "barrier", "borderline" with higher threshold characteristics. The same process occurs with the reflections from the parental lobe (and occasionally from other parts of the neocortex), containing this notion of "aesthetical acknowledging", or from subcortical regions ("aesthetical feelings") - so in this way the notion of

"aesthetical value" may be stored in the human memory. By repeated storages and retrievals of comparative information units, a person is trained in "aesthetical taste". This process is nearly invisible in normal human behaviour of a person, but shows significant differences by biometric scanning of a person's responses to the perception of artworks or even realities. Aesthetically trained readers read a text completely differently and may retrieve a vastly different form and content of the messages from the book, than laymen-readers. The professor of art history may see a vastly different world of various impacts in a classical painting than the guard in the same museum, despite his manifold experiences (daily exposure to famous paintings) from the same artwork. The artist may retrieve from the artwork (own or others) stimulators of unbelievable power and extend.

It should be noted that this "aesthetical impact" (which occurs in repeated "aesthetical acknowledging" or "feelings"), may have its origin in one or all three major parts of the information chain:

- it can originate from the artwork itself;
- it can originate from the environment, under which the artwork is intercepted;
- it can originate in the viewer, observer and his/her past experiences, memories or systems of thinking.

Among art aestheticians and historians, the aesthetical impact of the artwork itself is most understood. The environmental and meta-viewer aesthetical impact is much less explored.

A simple distinction of artwork from the environment (frame of painting, darkroom of theatre auditorium, silence before a concert) creates the first major environmental influence. The neurophysiological impact of these lies in the major change in the sensitivity of neuron circuits to the incoming information impact (labelled as "anticipation"). The stripping of an artwork from surrounding realities is also clearing the sensoric input from noise. All art of typography and layouts is based on this influence. Only in exceptional cases, is the "noise" welcomed, when either the information sources, artwork is too dense, too overfilled with information units (surrounding of TV sets as a welcomed distraction) or where the perception of artworks may cause natural fatigue of the observer (peaceful looks into a garden from the gallery

with many paintings). But there is more than the immediate environment of artwork: the environment extended in space and time, and projected back into the artwork as the viewer's perceptual cultural and mental stereotypes and archetypes which are invisibly influencing the molding of "aesthetical values" in the observer. There are very well known attempts to programme preceding and succeeding time or space segments around the artwork. The very sophisticated programming of space and time is visible in the churches, palaces or urban settlements known to nearly every civilization and culture.

A very peculiar situation occurs if we cross the time/space axis of the environment: (we exhibit Roman sculpture in 20th century buildings or read medieval books in a modern library, or hear Renaissance music from the radio). Then the environment may add or counteract to the original aesthetical impact. The same situation may occur with the temporal axis: (We present several views of a Roman temple via shots in a film or television programme or via a few photographs on pages of a book).

The origin of an aesthetical impact caused by the viewer (observer) is a rare case. It needs to have a person who has previous knowledge, aesthetical trials, education, that he/she can substantially add to the artworks seen or otherwise perceived. Generally, a person with a high lability of neuron circuitry of the cortex (often artists) are inclined to thissituation.

But these cases may also occur accidentally when a person has certain strong memories, attachements or sentiments to content or form of a specific, single artwork. In the past, such cases lead to the acquisition, stealing or destroying of artworks. In rare cases, "maniac attachment" may have its origin in exceptionally high aesthetical feelings (probably never the cause of aesthetical impact or acknowledgment).

If the final construct is of: (1) Direct (2) Substituted and (3) Projected origin, there is a difference in aesthetical impact. In the case of direct origin, this occurs when a person observes the artwork directly from the original, and forms and aesthetical feeling, acknowledgement or value on the basis of its observation. Substituted origin refers to a case when somebody or something else (book, review, filmed or television programme) reports on or about the artwork, performance. Here the skill, mental (editing) and technological (camera's point of view) manipulation may influence the final aesthetical construct of the observer.

The projected origin refers to the previous observer's knowledge, memories and immediate preceeding state of mind, and also to the adjoint ethnical, cultural or social stereotypes and archetypes of the observer.

There are several helping or adjoint processes in the human brain which substantially influence, speed up, delay or change the aesthetical notions:

1. The depth stresswave:

In certain cases of information input from the artwork into the human brain, the stresswave (emotion) may burst over several layers of the cortex and subcortical regions quickly and simultaneously (hypothalamus) or recticular formation). Reflection in this case in the upper cortical regions may evoke a notion close to the term "beauty". This notion can be inherent to many cases, only some of them associated with aesthetic feeling. So the classification or acknowledgment of beauty alone is not always close to the aesthetic, but significantly enhances possible aesthetical feelings, acknowledgements or values.

2. The "overlapped overload":

When information is incoming in the cortical region, usually the brain works inside the cortex much faster than the input. Therefore, certain regions already have a lowered sensitivity or neuron circuits for the input, others may set "barriers". We call such processes "anticipation" or "forecasting" (of a story, event, process of perception of an artwork). But the author of a play or book may use an unexpected turn, situation, color, musical tune. The input falls into the wrong neuron circuits, causing high resistance, stresswaves, blocking of neural pathways. But the brain re-adjusts quickly and follows new pathways. The remaining cortical or subcortical reflections of resistance are called "surprises".

Such a mechanism can be an important trigger to the conjunctions of specific firing and stresswaves, together originating the aesthetical impact of the piece. Usually, in this way, artists reach this expected goal much easier, than by the regular building of formal or theme domains. There is a very important fact of the "after-effect" of an overload. Surprise must be "cooled-off", in order that the brain may resume the normal rhythm and process of inormation processing. Repeated surprises may cause the oscilated perceptual

rhythm - which alone is a very powerful artistic tool - but in the final impact, lowers the sensitivity of the viewer, observer to the semantic part of the artwork's information.

3. The "imposed" information cascade:

The artist models the perceptual process of the artwork in the artwork itself. (By subjective camera, by a text of a book, the author "discovers" with the viewer or reader the space of the scene, the situation). In theses cases, the observer is willing in most cases to "be privileged to be with the author, to flow with the show ..." - and model his own perceptual process on the author's. The imposed cascade may sometimes cause psychotic or persuasive results (Eisenstein's filmic rapid montage), where the viewer temporarily changes his own beliefs, values, aesthetical judgments. But the effect of an imposed information cascade is of short duration, and ceases within a few minutes after the artwork's perception ends.

4. The "stimulator" impact:

Here the artwork serves only as a very minute initial input, usually of a formal nature, and the viewer, observer follows the perception in loops, occasionally returning to the initial artwork, but mostly performing his own mental variants, of the theme, of the forms, of the dreams. Most of the religious artworks, or many abstract paintings, are of this nature.

A specific case is the case of poetry and music, where stimulators are highly and frequently used. Here he distinguish programmed stimulators (most of the theme's music or poetry "with the meanings of words"), and stimulator envelopes (disco music, dada poetry). In the first case, the higher cortical functions are in operation, in the second case, the cerebellum or only parts of the left brain's hemisphere, like Wernicke Centrum are mostly in operation.

How far does the biocybernetical view of "aesthetical informational impact of the artwork "coincide with major schools of aesthetics?

1. Formism:

In one of the earliest world hypotheses, sometimes referred to "idealism", formists view and "ideal" behind each reality. Norms of beauty are reflected

in Aristotle's Mimesis, or an imitation close to such ideals. They judge how well the object conforms to such norms, or how much they differ from them. The "norms of society", "ideals of society" are the final critical questions. Plato, Aristotle, Augustine, Ruskin, Taine and scholastics are of this school.

Psychophysiologically, this aesthetical school follows the process of natural perception of realities, and from these repeated experiences, constructed a synthesis of the "ideal". Theroretically, there is nothing wrong with this approach. But practically, in the contemporary world, such cases rarely occur within an individual human brain. At first, human life is not long enough for a satisfactory number of experiences to create the temporal neural pathways encompassing the necessary "ideals". Further, human beings may not come in contanct with necessary experiences - and substituted experiences may not have the same impact and values. Finally, after a longer time, when such "ideals" are being formed in the human brain, the reality already has changed, and therefore the "ideals" are outdated, and no longer holds the right parameters.

2. Organicism:

Here I refer to the school of aesthetic objective realism, where two main variables are employed: the amount of material included in a work and how well that material is integrated in the work. Furthermore, the question of "feeling" should be incorporated into the artwork. Bradley, Royce, Schelling, Coleridge and Bosanquet are of this school.

This school is psychophysiologically more based on the formal parts of information within the artwork, with syntactic approach. The important feature of temporal neural pathway, content of artwork, semantic part of information is very rarely encompassed. Although usable for the process of artistic creating of the artwork, this direction misses important processes in the human mind, on which we base most of our behaviour.

3. Mechanism:

Here I refer to the aesthetical school viewing the things and people as systems, machines. The notion of causality is employed, as well as consideration of individuality of the perceiver, and necessity of the input (appreciation of the artwork, values can reside with appreciator). For mechanists, beauty is in the psychophysiology of the beholder.

From the biocybernetic standpoint, this school is much closer to contemporary discoveries. It acknowledges the notion of individuality of the perceiver and intuitively forecases certain notions of information processing in the human brain. But the concept of the information chain is missing, and the importance of the perceiver is overstated. Democritos, Lucretius, Galileo, Descartes, Hobbes, Locke, Berkely, Hume, Reichenbach, Santayana and Berlyne are of this school.

4. Contextualism

Here the major notion is of the living experiences one has within a situation and its context. The complexity of events, interconnections and continuously changing patterns are of primary importance.

So the matter of a person's involvement in the artwork, attachment to the theme, plot becomes a measure of aesthetic experience. Quality is the critical term. Dewey, Pierce, Mead, Bergeson, Pepper, Piaget belong to this school.

From the biocybernetic view, this school stresses the importance of many "helping mechanisms" of aesthetical experiences, but does not tackle the basis the the neurophysiological process where "aesthetics" have its origin in the human brain.

The neurocybernetic view of aesthetics can be summed up as such:

1. The notion of aesthetics is a complicated system of neural reflections within the cortex of the human brain. It may or may not need an external sensoric input which serves either as a stimulator or delivers certain content, messages from pieces of realities to the hierarchy of stereotypes and archetypes.

2. Aesthetical impact has a characteristic of temporal neural pathways (similar to any "thought" or "idea"), but what is retained in the long-term memory of the cortex is not the pathway, but its by-product, borderline resistance of surrounded areas. This resistance is not permanent, but changes more slowly than other neural pathways, and arises more slowly.

3. This feature is not inborn and must be learned by human beings during repeated experiences, but such learning is very slow, difficult and, in many cases, impossible.

4. The process of aesthetical impact varies significantly from person to person, across cultures and history.

5. The first level of reflection (lowest one) can be called "aesthetical feeling"; the higher, more complicated,"aesthetical acknowledgement or appreciation"; the most permanent and highest process can be called "aesthetical value".

6. Besides the basic process of neural reflections in the human cortex of the brain, there are many other helping mechanisms which work when we use the adjoint term "aesthetic". In this category, the notions of "beauty", "surprises", "anticipation" or "stimulation" belong. Although differently labelled in language, neurophysiologically works simultaneously and supports the basic "aesthetic" reflective process.

III. ARTWORK'S MODES, STRUCTURES AND MEDIA, AS REFLECTED BY THE HUMAN MIND

There are important differences in the process of aesthetical impact formulation from different kinds of artwork, i.e. pictures, books, music, film or television programmes. There are also differences when the artwork's modes of delivery differ, for instance during a direct experience (book), a performance (theatre), or a substituted transmission (television). Finally, there are differences arising from the structure of the artwork itself.

Beginning with the input of information, there are three basic differences in: (1) visual input, (2)aural/acoustic/input, (3) spatial input. In addition to these basic three, there is a significant multi-channel input (known mostly in the theatre, television, film).

1. Visual input process leading to the formulation of the aesthetical impact of artwork:

A. Reading of pictures:

Modulated light from objects of the outer world fall on the retina of the human eye, causing electrochemical signals (in the case of spectral transfer, chemo-electrical signals), which are transferred through visual nerve fibers over several gates to the part of the brain known as the visual neocortex. On its way to the brain the original signal has already been pre-processed. The neural pathway works on several levels, processing high speed, and within microseconds, evaluates the incoming signals from the eye.

The first signal reaching the brain is the parameter of light intensity, and its temporal distinction, the contrast. The diminishing negative and positive intensities of light on pictures mark the way in which the human eye "reads" the picture - from the highest contrasts to the undistinguishable greys. But the eye quickly changes the absolute light values into subjective ones (a process called accommodation). The spectral differences (color perception) comes as relative secondary input in limited range.

The greater the difference in densities contained in the picture, the more time the eye needs to read it. We can draw the curve from the fixation points as the pathway where the human eye reads a picture, which I call the visual reading curve. This pathway, in which the eye moves from one density to another, is not a straight one, but is divided between fast movement parts and fixations.

The fast movement parts we may relate to noise, fixations to the information bits of the image. On a biometrical multi-channel record, we see that during the fixation periods, the cortical regions of the brain are in high activity (doing memory searches, combinations, triggering stress-waves). The succession of fixations usually follows the contours or lines in the pictures (as the line or contour is interpreted neurophysiologically as differential potentials on the retina cells, with cumulative delivery stereotypes). This reading pattern quickly facilitates identification of objects or situations in the image.

The reading of any picture by the human eye takes time, even if these time segments escape our identification. With a simple tachistoscope, we can separate major parts of the visual reading curve. With more sophisticated instruments, sensoric tracking devices, we can outline exactly the path of exploration which the human eye follows on the picture. The addition of all the basic fixations in the first visual reading period, we call the general recognition time (GRT), which means the minimal time necessary for the eye to read a picture. These times are usually under one second. After the first reading of the image, the eye comes back to the slowest fixation and finishes the reading. After that to another slowest fixations, so long as they are significantly different fixations in the picture, or there is another, behavioural limitation in the time of the picture reading. Within one picture, we may achieve between 5-50 fixations, sometimes much more. If a person is left to his own pace, he may do more than 200 fixations before he/she turns to another artwork.

The typical process in that later time is to increase the fixation time on the picture element, and decrease the number of fixations per reading period (usually, but not always, bordered by blinks).

Formulation of the picture aesthetical impact goes on in several stages:

A. In the first, initial reading periods, usually the "helping mechanisms" are in operation. Various cortical and subcortical stresswaves, short-term memory searchs or repated specific firings, are distinguishable on EEG and EKG records. From this period, a person reports notions like "surprises", "beautiful/ugly", "attracted by the artwork" ...

B. During several further reading periods, the picture content is usually well identified and understood. In this second stage, the neural

pathways usually are formed in the cortical regions of the brain. These pathways are highly fluid, not stabilized, and they show a fast rate of decay. Some pathways are the result of semantic elements of the picture (content, theme), some others result from formal impact (colour, balance, perspective). The semantic pathways usually have some extent of activity into the parental lobes. The formal pathways always have some connecting high activities in the cerebellum.

C. With the appearance of the neural pathways in the cortex (the person is interacting his own mind with the picture), the number of eye fixations decrease and the person begins to fill the impact of the picture with his own imagination, discoveries, and explorations. During this period, the aesthetical impact of the image is reflected in the cortex. The person reports with more accuracy with regard to what he/she sees in the "beautiful" picture, points to small details of the picture, tries to see the picture from different viewpoints, and tries to share the experience of viewing with other observers or with his/her memories. The "borderline effect" of the neural pathway begins to be fixed as the long-term memory residua.

D. Finally, the number of fixations of the eye begin to be minimal, and accidental scans of the image increases. A person begins to scan the frame of the image, surrounding environment. Usually, if a person is given a choice, he begins to look for another view, picture, artifact.

There is a great distinction between the way a layman and a learned person explores the picture. An ordinary visitor in a picture gallery, viewing pictures as a leisure activity, may show the relatively long initial period (A), and the time spent on the succeeding phases (B, C, D) ceases rapidly. Such a person usually reports his behaviour as an "appreciation of artworks".

A learned person (historician of art) may scan the picture for an initial period very quickly (much faster than an ordinary viewer), but the succeeding period is longer (B), with the longest time spent on interactions with is own experience and memories (C). The overall time of observation may be manifold longer than that of the layman.

Special cases would be a visit to a picture gallery by an artist. Here, too, the initial period may be short, but the most time will be spent on the second phase (B), where special stimulation mechanisms on the base of the neural pathways will be put in operation, with many latent feedbacks (for memory of certain special skills, technologies, solutions of composition, color problems, etc.)

There are also several physiological factors influencing the reading of images, or preferences during the readings:

- so-called "gold cut" or $\frac{3}{4}$ proportion preference corresponds roughly with the position of the fovea (most sensitive place of the retina) in the human eye.
- the notion of the picture axis (orthogonal, diagonal) corresponds with the ability of certain cells in the retina to fire significantly higher signals, when such directions occur.
- the notion of perspective and volume corresponds to the feedback mechanism between the retina(visual neocortex) which then adjusts the eye lens via muscular movements.

Other preferential factors may result from long cultural stereotypes:

- the preferences in certain fields (reading clockwise in the Western hemisphere as opposed to counterclockwise in Asiatic and Arabic cultures).

And still other factors may influence preferencial reading based on the long influences of the environment:

- preference of the horizontal axis (and, therefore, amplifications of verticals) by the dweller (in polar or desert regions) and the extrapolation of such processes by urban (city) dwellers.
- preference of spectral changes (Canadian Eskimos distinguish seven shades of "white", but only three densities of orange).

Transfer of information from color pictures:

Usually, for peak sensitivity of the human eye, the mechanism of the specific spectral interception is the base of input signals to the brain. For the borders of the spectrum, the resistance mechanism is carried as an information signal, sometimes triggering stresswaves in the cortex. Generally, by observation of black-and-white pictures we see longer and fewer eye fixations (which enables a person to spend more time for processing of information in the brain); for color pictures we see more and faster fixations which may originate in certain formal aesthetical impacts.

A specific situation occurs in the case of moving pictures (in film, television). Here we distinguish the impact of two kinds of movement: internal (inside the picture) and external (movement of the full frame of the picture - camera pan or tilt).

It always depends on angular differences, combined with basic picture parameters (contrast, brightness, hue, linear details), if the movement is perceived at all, or if it is "fast" or "slow". Also, the previous picture environment and the following one (previous and following shot) determine the effect of the movement.

The volume of moving parts of the picture influences perceptually reported speed of the movement. Moving big parts slowly will produce an impression of higher speed, more so than moving smaller parts slowly. Different densitities moved across the screen produce different impacts.

Specific impacts are experienced when two or more elements are moved in juxtapositions. Striking impacts are achieved if two different media are used with moving pictures (actor-screen, still-moving, rotating picture). A succession of moving pictures influence perception of speeds and axis within the pictures, so the actual parameters of the moving image are perceived differently than those existing in the information source (film, television programme).

B. Reading of Graphics

There is a great difference in the reading of graphics from pictures of reality - if we analyze the sensoric tracking recordings.

(1) There may not be an"initial reading period" at all - or it can be subdued. In many cases, the eye skips (in a matter of a fraction of a second) to the major density, line or area of the picture.

(2) The eye produces significantly more fixations per period than in reality image, and these fixations have a repetitive pattern, suggesting that pieces of graphical image are used as stimulators for internal cortical processing.

(3) There are many "empty" periods during the accidental eye scans, but this does not mean loss of interest of the viewer. The EEG record usually shows high processing activities.

(4) There is an unnusually high number of memory searches, beginning very early during the period of graphics observation, suggesting that the viewer is trying hard to associate the stylized reality with his past

memories.

(5) There are fewer memory storages identifiable from the EEG record by observation of graphical pictures.

In summary, graphical pictures are able to deliver their form and content much faster than pictures of ordinary reality (although stylized as in painting or photography). This presents an important advantage and danger for the formulation of an aesthetic impact. The advantage of it lies in the increased potential of the artwork as a powerful stimulator to the viewer's brain (but if this process does not find the associative memories within the viewer - a person reports he is "turned off ...", e.g. by an abstract painting).

The danger of this lies in the time scale of the viewer in which the artwork is observed: if the time is significantly longer (by choice of the artist - as in film and TV editing) or by choice of the viewer (as in picture gallery), then the attention of the viewer ceases or the viewer begins to project unrelated memories and other information quanta pertinent to the exclusive individuality of the viewer, into the artwork.

There is also a moment of abstraction, stylization in every graphical picture, which influences the formulation of the aesthetic impact: if you shape any form farther from the past viewer's experience or natural form differently, the viewer begins to reflect the build-up of the resistance level in the neuron circuity of the cortex (usually associated with feelings of "truth" or "lies"). If the form is very distorted from any reality without any strong semantic reason to do so (as in many abstract paintings), the viewer sometimes scopes on small, unimportant information quanta within the image in order to gain an "acceptable" level of thresholds for the processing of unknown information from the picture. This process may influence the viewer in the preference and orientation to many further similar experiences.

The information cascade in the viewer's mind during the successive perception of graphical pictures (i.e. in animated film, television graphics or even in a simple comic-strip) are not ordinary sinusoids, such as by observation of half-tone realistic photographic pictures, but it may appear as a series of sharp peaks of signals, with the attention quickly raising and ceasing. Within the "lows" a person usually employs high processing activity of the brain.

C. Reading of a book, text, letters:

Here we deal with very special, highly stereotype mechanisms of perception, processing and storage of information in the human brain. There are several important stages during this process:

(1) Identification stage

This is a process going on in the sensoric memory, with a minimal impact of the cerebellum. Electro-retinographic studies suggest that the perception of letters of the alphabet occur in a speed beyond the obvious persistence of vision border (1/6 of a second), and identification can be completed as fast as 1/500 of a second's time. The speed of identification depends mostly on the shape of the letter, but also on the contrast ratio between the background and letter. A higher contrast and much faster identification follows (hence most printing is done black on white surfaces). But there is a significant difference of contrast in reflected or translucent modes. Most of the reflected light from surfaces give optimal results in contrast 1:5, 1:7. With translucent light (i.e. in microfilm readers, video display of characters on computer terminals), we can easily reach the contrasts 1:20, 1:35 - but this results in fast visual fatigue or uncomfortable viewing for the viewer.

(2) The pre-processing activity in the cerebellum of the brain is the second specific mechanism which is pertinent only to the written language, and to the percpetion of mnemonic signs (so-called international traffic signs, information signs - usually simplified symbols of real objects). During this stage, the short-term memory is in high activity. On high speed EEG record we can see violent short memory searches, arising and ceasing many times per second. During this time, another part of the cortex from the left brain's hemisphere (so-called Wernicke Centrum), fires back rapidly. This is probably a process where letters are joined into words, but still these structures are no carriers of semantic information parts. From here, a person may reconstruct the motoric response (speech) by a loud reading of a text - but the text may not be understood or appreciated

(3) Analytic activity begins with a certain delay between the left hemisphere and parental lobes. On EEG records we see a high amplitude of the envelope curve - but it is nearly impossible to distinguish specific events like the "understanding" of a single word or phrase. During this period, interesting feedback occurs: a person may direct the eye away from the text, or repeat reading of certain words or phrases - or skip future words. Another

interesting fact is that this process yields nearly identical EEG activities as it occurs by mathematical transactions, counting.

(4) Short-term memory storages

Within a second's range from the identification of letters and words, a person has some kind of temporary memory storages. On EEG signals we can observe a characteristic of "memory triangles", or regular ceasing of activities to the stages of metabolic rhythms, but these events occur very quickly and do not leave any visible residua on EEG records. What is somehow perceivable are the more permanent changes of the surrounding cortical area, not directly associated with speech. Probably most of the semantic impact of the read text (understanding of text via associative memories) occurs here.

(5) Feedbacks (intermissions of reading)

After a certain time (around 20-40 seconds, but here the time is very individual and irregular), a person interrupts the reading, looks into a different environment, or, rarely, closes his eyes and daydreams. These interruptions are in direct relationship to the quantity of information in the text. Usually, a person may take amounts of 200-2000 bits of information (smallest distinguishable parts - not necessarily letters or words) between such interruptions.

There are two bases for such an interruption: (a) a metabolic one, when the eye and the brain need to refresh the exploited potentials, and (b) the mental one, when a person needs time for cortical reflections of the text himself. In this time a significant formulation of aesthetical impact occurs. Most occurrences are fixed in long-term memory (a person can easily recall the page, event or phrase which he labelled "beautiful", "striking").

In some cases, a person uses his own mnemonic feedback (silent recitation or loud rereading of paragraph or phrase), which helped significantly in the formulation of aesthetical feelings.

(6) The "borderline storages"

With a great delay of several minutes, hours or days, comes the last stage of influence which:

- helps to formulate the "aesthetical value";
- matches the semantic of the text (content) with the reader's "values" and ethical "codes";
- brings a person's behavioural changes.

In this stage, most of the details of the text already have decayed from memory, and the person can only remember major events, stories, or a few phrases of the text. The recall of precise repetition is nearly impossible.

Within the brain's cortex remains only the "envelope" of the text containing only a few factual information parts within the temporal neural pathway, and a few "borderline" residua - the "aesthetic" and "semantic" impacts of the text.

It is usually this stage which formulates the verbal recall of the reader by psychometric research questionnaires. The effect of the "enhanced retrieval" may add or distort the information base of the text residing in the reader's brain.

There are significant differences in the processing of a text, arising from the perceptual categories carried in culturally bound logic. These differences can be of a quantitative character (Eskimos may have more than twenty words for "snow", Montrealers only have four), a syntactic character (difference between Arabic and western European languages), or an abstract logical character (appraoches to problems by Chinese and American thinkers).

Another significant difference is imposed by the surrounding informational environment. Current biometric studies suggest that on the American continent, reading bears irregular characteristics of information pattern perception, whereby patterns may or may not always be residing with the text, but also with the reader's stereotypes and archetypes. Reading journalistic news in newspapers can be a most pertinent example. Key words are of primary importance, but more than words, are the stereotypes of meanings, events, persons, which direct the "skimming over" of the unimportant parts of texts. American journalism developed an intricate methodology of "headlines" in this sense, and spacing the events within the pages of the newspaper, journal. The methodology of "speed reading" is also based on information pattern perception.

In such cases there is a side-effect of an information overload. A person processing large information patterns in a fast manner has less time for his own individual reflection of "thoughts", "ideas" he has read - and the text may result in certain psychotic or persuasive impacts (e.g. never

intended by the originator of the text, but acting on by the reader).

2. Aural (acoustic) input, leading to the formulation of the aesthetical impact of artwork

A. Listening to sound

The human ear amplifies pressure waves from the air in a fast repetition (of 14-16,00 Hz) mechanically by bones and fluid, transferring these pressure waves into electrical signals reading the audio cortex in the cerebellum of the brain. The spectral range is perceived by the human ear unevenly: with a certain range the ear may be specifically sensitive to the successive sound (speech, articulations - range 500-3000 Hz). In another range (800-8000 Hz), precise sensitivity to wavelengths of sound exist (music, tunes). In extreme ranges (low around 14, high above 18,000 Hz), sound may have a broader impact than hearing on the human body. There is a specific junction between hearing and spatial orientation due to the proximity of the vestibular centrum to the inner ear (impact of stereo and spatial sounds).

There are significant differences of aural input from the visual ones:

(1) The audio neocortex is of a markedly different size in the hearing of each person, suggesting that there are substantial differences in heard sounds, than from seen pictures.

(2) The time base of the aural input is significantly different. Sound can be perceived and processed much more slowly than an image. Separate sounds are rarely distinguished beyond the frequency of 80 Hz when picture parts may still be recognized in a frequency of 500 Hz.

(3) When sound is perceived, the neural activity is significant in both hemispheres - with the exception of heard speech.

There is also a vertical difference between aural and visual information processing. In general, visual information processing largely influences the surface of the brain cortex, the audio information processing is connected also the the hypothalamic regions of the brain (this is why audio information can easily evolve emotions).

This (emotional) impact of unstructured sounds (noises) is most apparent (and, as such, used in film and television as "background sound") in applications. It can itself only rarely carry an independent notion of "aesthetical impact". Only association of sounds with past memories, events may evolve in the reactivation of temporal neural pathway, "aesthetical feeling". In most cases, the mechanism of stimulation is in action (listening to the surf, waterfall, wind).

Here, cultural or environmental differences may play a significant role. For example, a tribal hunter may distinguish more than 300 sounds in a forest, and some sounds may create "aesthetical feelings" for him due to past experiences completely unknown and unattainable by the urban dweller. Or, on the opposite side, the environmental impact of machine sounds of the city can indirectly influence the "aesthetical feeling" from loudly played rock or disco music.

The contrasting acoustic is probably much less known than contrasting rhetoric. (The world Soundscape project of Canadian composer, Murray Schaefer, is one of the rare projects acknowledging the necessity of learning the sound environment of our age).

B. Listening to speech

Most of our speech sounds are generated in the larynx and filter through passages of the vocal tract. Their lengths, diameters and position determine the format frequencies of the sounds of speech. Speech encoding and decoding is accomplished in two areas of the brain's left hemisphere - the Wernicke's area for decoding, and the Broca's area for encoding. The Wernicke's area is near the audio neocortex and an injury to this area produces an aphasia which causes the victim to drop critical words from sentences, use incorrect syntax or forget correct spelling; the Broca's area is higher in the left hemisphere, near the motor cortex, and an injury hampers the individual's speech and writing.

According to Lieberman, there are three different processes which occur simultaneously during speech hearing: formal, syntactic and semantic decoding and encoding. The formal decoding preceeds both processes and refers to the intonation of the voice, spectral and aptitude characteristics of speech. Syntactic decoding refers to the grammar of the speech. Semantic decoding refers to the meaning of words, sentences and ideas. Noam Chomsky, in his theory of tranformational grammar, distinguishes the logical and surface structure of speech, both interacted when meaning is extracted from the speech.

It is difficult to match the spectrogram of speech with the biometric recording of the brain's activity during the hearing of speech. More knowledge brings to us digital representation of speech signals, related to the 3D (Fourier analysis) representation of multi-channel biometric records during the speech.

Here we see that speech sounds are of three basic kinds:

- Voiced sounds (produced by exciting the vocal tract with quasi-periodic pulses of air pressure caused by vibrations of the vocal chords);
- Fricative sounds (produced by forming constricution in the vocal tract and forcing air through the constriction, thereby creating a turbulence which produces a source of noise to excite the vocal tract);
- Plosive sounds (produced by completely closing off the vocal tract, building up pressure and then quickly releasing it).

All these scurces create a wide-band excitation of the vocal tract, which, in turn, act as a linear time-varying filter significant for the transmission properties on the frequency spectra of the sources.

In the digital representation of speech spectrograms, we may find cues to the corresponding processing of information in the human cortex. A few basic phases occur:

(1) During the formal decoding, the spectral characteristic of speech are preferentially analyzed in the brain, which, together with the aptitude of speech signals, are responsible for the sub-cortical processes (occasionally accompanied by motor listener responses), with minimal residua in the short-term memory.

(2) During syntactic decoding, the succession of sounds of speech are of primary importance, and short-term memory plays a main role in processing information.

(3) During semantic processing, the input channel (signal in audio neocortex) is subdued, and feedback mechanisms (motor skills of listening, movements) are in operation.

The aesthetical impact may arise during all three phases of listening, but formal decoding yields most of the "aesthetical feelings" from speech, syntactic decoding yields most of the "aesthetical acknowledgement, appreciation", and semantic decoding yields the possible formation of "aesthetical values".

C. Listening to music

Here I refer to the term "music" as at least partially programmed sound structure (either by the composer, the performer, or both) - as this aspect differs the information processing from the listening of unstructured sounds. During the listening of sounds, the higher neural activity occurs in the right brain's hemisphere, and the stereo-hearing, the sound localization is an important part of the process. During the listening of music, sequential information processing

is a major mode.

The spectral variations during the listening of music (tunes) start to influence the information processing, not only in the right brain's hemisphere, but also the left, and the parental lobes area - resulting in the identification of "melodies", "tunes". There are certain temporal borders ("slow" and "fast" music), beyond which the sound is not recognized as music (starting in frequency between 60-80 Hz), but information is still deliverd and processed by the brain up to the fluent frequency changes (glissando) of 400-500 Hz.

Special cases occur when several spectral frequencies are presented simultaneiously ("chord"). Here, the listener is pressed to identify and process sounds in close relationships and comparisons. The judgment of such a structure is significantly influenced by subcortical stresswave development (and its reflections via the cortex) - which determine the harmonic impact of music. The musical sounds are processed in the human brain in great similarity to mathematical equations. The brain has the ability to compare two or more sounds, compare the different aptitudes of soundwaves, and to assess the directions from where the soundwave is coming from. From these comparisons, cortical reflections are constructed, which we may label as "identification of melody, tune, chord". But simultaneously, other subcortical regions of the brain are influenced. The region around the hypothalamus may contribute to the notions of emotions, arising through the hearing of music, the regions of subcortical shales around the motor area may be active in the identification of rhythm. The amplitude of heard music may influence several cortical regions simultaneously, and consist, also, from the neural signals perceived from other parts of the body, outside the ear.

The "aesthetical impact" of music occurs in three stages:

(1) During the identification stage, the successive structure (melody, tune) creates vaguely temporal neural pathways which we may relate to "musical thoughts" (during the creation of a musical piece, these "thoughts" are primary materials to the composer - so-called "motives"). We may relate this influence to the "semantics of music".

(2) The sub-cortical process associated with the musical sound processing very often yields the notion of "aesthetical feelings". These feelings are not very often reflected or acknowledged, and may arise and decay without too many cortical reflections. But they contribute significantly to rising or lowering the threshold of the neuronal circuitry, and are, therefore, originators

of action of "helping mechanisms", like stimulators, overlapped overloads, etc. In these cases, the person refers to "beautiful music", "charming tunes", "beautiful melodies".

Another aspect of subcortical activity is connected with rhythmic patterns of music. The rhythm of music usually substantially influences the perceptual rhythm of the listener, who occasionally, even makes supportive motor fixations (i.e. by dancing, clapping hands, swaying head, etc.) The younger the listener is, the more these motor fixations are demanded and realized.

(3) There is very interesting residua from listening to music in the form of subcortical long-term memory. The "borderline" features of decayed information pathways remain from the information input and processing of music in the brain. A person "likes" the musical piece immensely, but cannot reconstruct the melody and cannot remember the motives or tune. The musical piece is remembered in the mind of an "empty envelope". The reversal, cortical reflection of this "envelope" have their origins in "aesthetical appreciation, acknowledgement" of a musical piece. The retrieval of such a state is always immediately enhanced when the listener is exposed to the repetition of the composition, and can immediately recall the melody, tune, syntax of the piece.

The "aesthetical values" most unlikely constructed in the human brain from the hearing of music are featured. Only with a person who is very often exposed to the repeated performance of many musical pieces with possible recalls to the borderlines of the temporal neural pathways become, after a longer time, filled with the semantic and formal features, which can be recognized, reflected and systematized by the human brain. One likely "short-cut" to the aesthetical values acquisition in music is either the temporal comparison (sticking to "famous" composers, "famous" compositions from the past), or stimulation (hearing the same musical pieces many times and analyzing the tune, form, and semantic components of the music in great detail).

In addition to cultural and historical variants in the aesthetical impacts of musical pieces, a substantial switch occurs in recent years. The traditional tereotype of listening to music prefers the frequential differences as denominators of values and aesthetical impacts (nature of melody, chord, tune).

Due to environmental influences (noises, city sounds, machine sounds, overloads of sounds), young generations process musical sounds more evenly in their frequential, spatial and aptitudinal variables. This means that for young people, the intensity of sound and its direction are substantial for the formulation of the aesthetical impact.

2A: Multi-channel information imput, leading to the formulation of the aesthetical impact of the artwork:

Multi-channel input of information is a very popular one in our time. Films and television replaced the former limited impact of theatre, and its most opulent audiovisual genre, opera.

But the base of the powerful impact cannot be found in a simple comparison or quantification of visual and audio information input. Some authors (Broadbent, Garner) were convinced that simultaneous input from two channels into the brain's cortex is not possible, and that information jamming occurs. Both do not take into account the amount of information and redundancy. Such situations are very rarely in the brain's cortex. There is a general limit of physiological capacity of input and processing of information (sometimes referred to as modality of neural system), but from the praxis, we know that the bisensoric input is perceived by the majority of people with comfort and ease.

Quantitatively, man's information processing capacity is quite stable, and varies between two-three bits/seconds. According to Miller, this means the brain can handle five-to-nine elements or units at the same time. Fortunately, people are well equipped against overloads of information by the mechanism of "information skimming". Much more dangerous are information underloads which can retard a man's future information processing capacity. Visual and audio information are highly filtered before processed, and large amounts of information are discarded immediately in the sensoric and short-term memory. The cortex of the brain processes only a minimal part of audio-visual information (around two-three %), but sophisticated pre-processing - audio-visual information can be transmitted faster than single-channel modality, and can be reflected faster. Also, the extent of the cortical processes, triggered by audio-visual information, can be different from the single modality. If such audio-visual information is transmitted and perceived at one given time, the impact can be very beneficial on the human brain. The difficulty arises when bisensoric information quanta are presented and processed in fast succession (as in film or television programmes).

In these cases, due to the overlapped information, the impact results in an information cascade, forcing the observer to quickly skim the images and sounds - discarding often important pieces of form, theme, content or style in fractions of seconds. Therefore, the film or TV programme in the mind of the viewer is diametrically different from the quantitative account of tape or celluoid base shots (which makes the various methods of detailed frame-by-frame analysis of films and television programmes highly questionable.

By bisensoric processing of information, the modalities of each channel vary - not only the choice of the artist - but by the choice of each receiver also. The artist sets up the fixed preferences (in each shot he may carefully edit the amount and manipulations of visual and audio elements) for the artwork, expressing a certain style in his stereotypes and preferences. The perceiver of the artwork may have cultural, ethnic and temporal preferences. (An example of temporal preference might be the contemporary switch in audio-visual preferences among North American audiences: older generation: 70:30% (70% preferentially pictoral and 30% sound information characteristics demanded in film or television); younger generation 40:60% (rise in the importance and perception of sound information).

Broadbent's and Garner's concept of single modality works in a situation where the receiver must make a choice between channels. It is inevitable that before you say a word, an enclosed image can deliver hundreds of information bits for cortical processing. In contrast, when visual information is exploited within a certain time (a talking face on a TV screen), sound information can bring an indirect meta-information impact (emotional impacts from seeing the President's face during a TV speech). In situations where visual information is either pre-processed or stylized (animations, graphics), the sound information may carry a very important semantic impact.

Generally, the combination of visual and audio information can be changed in the intervals close to the perceptual rhythm of the receivers. When a certain rhythm is established (hence the importance of a "title song" in TV sitcoms) at the beginning of the film or television programme, there is a tendency to find the message of information source in a succeeding, different channel. The perceptual time axis in combinations are staggering: to say one world in sound takes about 1/5 of a second; to present the same word in graphics on a screen takes about 1/20 of a second or less to read it, and visual representation of the same code can be identified in 1/150 of a second.

The formulation of aesthetical impact from audio-visual artworks (films and television programmes) has a profoundly different phase than that of a painting, a book, or music.

(1) During the perception of a film or TV programme, information is presented in such quick successions, that the observer rarely has an opportunity to reflect on the flow of images and sounds in the cortex. The brain's function is somehow limited to the processing of the minimum of semantic elements (hence the viewer wishes to rather follow the content of a film, to flow with the show, than to study formal or other syntacti c phenomena). But through this quick processing, there remains three kinds of residua, which can be retrieved later for reprocessing:

- semantic residua: permitting the recontruction of the story, content;
- formative residua: permitting certain camera shots, the style of setting, decor, to be remembered;
- neural pathway residua: associating the film/TV show with certain values, moral or ethical thoughts.

(2) Domains perception:

During the time of the film or TV programme, the viewer establishes a certain pattern of perception, and then simplifies the perception and processing within this framework. The domain can be a known actor, location, situation (sitcom). Here, when authors of the artwork use helping mechanisms (of surprises, unexpected turns, humor, vulgar or lyric stresses), the receiver may formulate the "aesthetical feeling" during the performance of the film.

(3) Cumulative cascades:

In some artworks, the author carefully programmes the elements of the story and forms to build up tension, curiosity, discovery to a peak and catharsis. These cumulative cascades work mostly on specific neuron circuitry during the build-up period, and on the subcortical level during the catharsis (laughter, weeping) as motor reflections of subcortical processing.

During the performance of a film or TV show, the expantancies of the domains of the cascades are often not fulfilled within the viewer's framework. Such situations cause dissatisfaction, and in a large amount, boredom. If a specific content is delivered at that time (educational films), the viewer reports the scene as "not understood".

The aesthetical acknowledgement, appreciation - or formulation of aesthetical values of film and TV shows - very rarely occurs. It takes several forced, enhanced recalls to bring the viewer's experience from perception to camparison with his past (aesthetical) memories, states of mind. In this time, the actual experiencesfrom film, TV are usually decayed or significantly distorted. What remains in the human mind are "envelopes" of neural pathways, filled with random, unsystematic details of content and formatives. Only a very few people, trained in the criticism of films and television programmes, can formulate aesthetical values on the artwork quickly and accurately. (This is one of the reasons why critical reviews regarding the same film may differ significantly even in the same time and from the same place). The critics' tools for analysis of audio-visual information complexes are rather primitive compared to the established traditions of criticism in literature or in visual arts.

This situation is merely "felt" by the aesthetical schools - and one of the reasons why until current times, some authors questioned film or television as art.

3. Spatial information input leading to the formulation of aesthetical impact of artworks

This is the area tha is very little explored in aesthetics. Generally, I refer to the aesthetical experiences from initial spacial locations (and changes in latitude, longitude and elevation) which we usually describe in terms of time, distance and direction; to the process of this change and aesthetical impact we derive from it, usually called spatial information, and finally, to the anatomy of space, in which space-establishing-elements play a main role in the formulation of aesthetical impacts from space.

A. Aesthetical experiences from spatial orientation

Man is not only able to move in space swiftly and effectively, but is also able to reflect his motion via the brain, or share such a process via sensors (seeing somebody moving in space - in ballets, theatrical performances).

The reflection of one's own movements in space is perceived partially by our senses, partially by a special system called vestibular formation (behind our inner ear). Together, the signal can be labelled as spatial orientation.

Although visual perception of space is a leading information channel

input in spatial orientation, the other senses cooperate in various degrees (auditory, olfactory, thermal, proprioceptive and tactile stimuli usually occupy 10-30% of all information input). Experience from spatial orientation, in the broadest sense, is a biological function necessary to the continued adaptation of any organism to its environment for the purpose of survival. But within this original purpose, it draws on a broad range of sensations, some of which are of a purely emotional origin, but many refer to general or individual feelings of the person from the space. The notion of distance ("bigness", "smallness", "high", "low", "broad", "narrow") may trigger the helping mechanism of stresswaves or overloads - which may interact with cortical reflections, creating strong aesthetical feelings. But fixation of these feelings, or further analysis as aesthetical values, rarely occurs in the human brain. (Such situations commonly occur when a person experiences a walk in nature, sightseeing in a national park, walks through a historical building or fort).

B. Aesthetical experience from the anatomy of space

We judge all spaces around us by the criteria of human occupiability. Since we can experience more than one occupiable space in a given time, it is necessary to distinguish between such simultaneous spaces (for example, one may be in the fifth seat of a bus, on a raised causeway lined with trees, crossing a lake set in a bow of low hills which are surrounded by distant mountain ranges). This represents a set of six simultaneous spaces; or one may be standing on a rug covering part of a floor area of a balcony of a house, located in the suburban area with trees overlooking the tops of highrise apartments (five sets of spaces). For our purposes, we may distinguish primary and secondary spaces (in primary space referred to the space occupied in direct contact with our body; secondary spaces all those more distant and indirect to us). In secondary spaces, distance may be the further distinguishing aid: we may differ between local spaces (habitative space, social-consultative distance, limit of facial expression, limit for public distances), transitional spaces (limit for discerning actions), and aerial spaces (maximum distance for seeing people, horizon distance). All these spaces may create aesthetical experiences.

Primary space is usually the source of immediate feedbacks during the spatial orientations. Further reflections of this feedback into the cortical processing regions (usually reinforced with multisensoric information input) is a possible source of aesthetic experience (one stays on the nature trail,

visually experiencing scenery and feeling by hand the bark of a sequoia). Here, a very important process may occur: during such an information input when not only the event itself, but its reflection, is registered and fixed - the event itself can be elevated into the long-term memory by the by-product (aesthetical feeling), so the aesthetical impact may be the reason for storing such an event in the human mind, sometimes for years to come.

Secondary spaces are experienced usually as "information envelopes" of events in our lives. But, once more, reflections of feedback from secondary spaces (view into distant horizon with several mountain ridges in profound aerial perspective), may contribute significantly to the storages in the long-term memory.

C. Aesthetical experience from space-establishing elements

As we move through space, we do not perceive it continuously, but we divide it into smaller pieces, perceived and processed individually by the brain. So, we can say that there can be a "space perceptual grammar". This process is very remote to any linguistic notion. The division of space elements may follow, for example, conceptual dimensionality. Lynch distinguishes two-dimensional elements (districts and nodes which one may enter or traverse, one-dimensional elements (paths and edges, which one may cross), nominal no-dimensional points (landmarks seen or passed around), and signs, symbols in space. Or there can be purely perceptual divisions of spatial elemtents (surfaces, objects, screens). And, finally, all spatial elements may have important attributes (volume, enclosure, completeness, cohesion, balance, symmetry, rest), and these attributes are perceived by us in an isometric way (eye level, surface level). There can be an aesthetical experience arising also from the syntax of spaces (how the spaces are connected - via port, end, merge).

Aesthetical experiences from such "space grammar and syntax" are similar to the experience from multisensory input (like film, television), but there is an important difference in the coincidence between the observer's perceptual and processing rhythm and the perception of space. The other sensoric input (olfactory, tactile) play important roles also.

There is also a whole area of space establishing elements arising from visual perception of space, illumination of objects, implying spectral compositions and direction of light. The light itself can be a source of spatial aesthetical impact from combinations of reflected, inter-reflected, filtered, diffused, absorbed, refracted lights. Then there is a group of

impacts arising from the articulation modes of illuminated objects (shades, or arrangement of pigmentation of objects - color space). Finally, there can be aesthetical experiences arising from a particular association of illuminants and modulators (labelled as "bright", "dull", "dim", "dark"), temperature feelings ("cold", "warm", "neutral", "hot"), and from the shades and shadow patterns. From the combinations of these elements may arise higher structures - moods ("cheery", "somber", "bright", "radiant", "sparkling", "bleak", "looming", "intimate"), which themselves cause an aesthetic impact (not even registering the individual space establishing elements which cause it).

The area of spatial input may be a source of very strong "aesthetic feelings", but much less occasions of "aesthetical acknowledgements" and, rarely, the origin of "aesthetical values". The reason for such an imbalance is probably in the underdeveloped "spatial language" of man, where most of the "space, grammar" is learned by random experience only, and rarely, logically systematized (and reflected) by our brain.

It should be noted that the aesthetical impact may arise also without a direct sensoric input. Humans are, due to the developed memory storages, able to reconstruct latent information retrieval (imagined picture or situation, music of mind). People usually associate this process with dreaming, or day-dreaming (although these two processes are of a very different origin!!) Appriximately 30% of aesthetical impact may arise from such latent reconstructions! The more memories, past experiences a person has, the more likely he is able to latently reconstruct the events. The ability to do it is sometimes imperfectly called "imagination". Usually by latent reconstruction, a person works in simplified stereotypes and archetypes (even of the memoric recollection contains the exact small details of the scene or event), and, much faster than in ordinary life. This high speed associates the process with real dreams (REM periods during sleep).

IV. ARTWORK'S WAY OF DELIVERY AFFECTING THE FORMULATION OF AESTHETICAL IMPACTS

There are basically three delivery ways affecting the formulation of aesthetical impact for an artwork:

1. direct delivery (reading a book, viewing pictures in an art gallery);
2. performed delivery (by a musician at a concert by an actor on the theatre stage);
3. transmitted delivery (as in film, television or radio programmes).

Direct Delivery Process:

Here, the viewer/reader is the main determinant of perception and processing the information from the artwork. Although the environment of the artwork, as well as the viewer's perceptual and mental stereotypes influence the process, the delivery of information from the artwork is carried by the viewer's pace, only remotely programmed by the artist.

The freedom of perception and processing is the main attribute here - but has its advantages and dangers. The advantage lies within the coincidence of the viewer's own perceptual and processing rhythm with the input of information from artworks; the disadvantages are either overlaps of information (e.g. in a museum when the magnitude of the artworks is viewed during one visit) or missing cues (the viewer may not retrieve all the visual cues and details composed and executed by the artist from the painting). General fatigue from repeated perception of the artwork is one major effect. (For example, measurements in an art gallery (Musée des Beaux Arts, Montreal) shows that a person spends shortly after entrance of the gallery, 2 to 4 minutes viewing an individual picture, and before exiting from the exposition halls, only 16 to 35 seconds are spent for viewing individual artworks).

An important aspect in direct delivery is unlimited time for reflections, feedbacks. The reader of a book, visitor in a gallery always has the possibility to sit down and think about the picture or page of a book and return to the original artwork immediately. This has crucial importance not only for the memory storages, but also for the stimulatory effect of the artwork on the viewer/reader. The more feedbacks occur, the more likely the formulation of aesthetic impact from the artwork occur. Therefore, it is immensely important that there is a comfortable environment (seats in gallery room, typographical layout of book, illustrations in book), inviting such reflections.

Performed Delivery Process:

Here, the artwork is executed by a live performance, in order that the artwork is perceived in the most impactive format. There is an important advantage and disadvantage of such delivery modes.

By the way, as the artwork is performed by the same human being, as the person sitting in a concert hall or auditorium of a theatre, many cues or symbolic expressions are not only easily understood or appreciated, but also performed exceptionally well (virtuoso in concert, famous singers or actors). The observation mode enables the perceiver not only to follow the general content of the play or musical piece, but at the same time, he/she can compare the repeated cues, skills and, therefore, judge the artistic performances. Further, such elements still can be reflected, and reflect formal parts of information may create the aesthetical appreciation. There is another important aspect here playing a role. The person in the auditorium may adjust quickly to the flow of the piece (of a music, play), and share the formative and semantic elements of the artwork's structure in a psycho-dramatic process (playing "with" the actor of musician in the mind of the viewer, "flowing with" the progression of the story, plot or theatre play). Such a process may create many aesthetical feelings in reflection.

The time (several minutes) immediately preceeding and succeeding the performance are unusually important. The preceeding time is important for the adjustment of the viewer to the "imposed" perceptual and processing rhythm in the play (overture in opera, foyer in museum). Also, the first few segments of the artworks (few bars of music, singer's or musician's entrance) are critical for further modes of processing the work in the observer's mind.

The succeeding time is important for the fixations of information patterns and reflections of it by the viewer (applause in the theatre after the play and reappearance of actors on stage - as rich stimulants for viewers; or viewing and buying books, postcards after the visit of a gallery).

The preceeding time influences the formulation of the aesthetical impact, mostly by sensitizing the viewer; the succeeding time is important in the sense of completion of memory storages (therefore, important for the formulation of "aesthetical values").

The advantage or disadvantage of the performed delivery ultimately lies within the performer: the actor/musician may or many not interpret all the facets of the artwork, notated in the score or the script of the play. There is also an important aspect of "personal contact" between the viewer and the

actor/musician and shared "feelings" (laughter or applause from the auditorium for the actor), which contributes to the formulation of aesthetical feelings.

There is another disadvantage of the performed delivery: the temporal mode. When a play or concert is performed, the viewer must follow the play - so the possibility to reflect or think is done at the expense of missing the following information. Occasionally, the author or actor counts on such occurences (and makes a pause), but approximately 40-60% of the time segments in performances are processed in the brain of the viewer without a chance to be immediately reflected. If such reflections cannot happen within the short-term memory period (20-30 seconds), there is a minimal chance (less than 10%) that this piece will be remembered or reprocessed. This, of course, does not mean that only 10% of the play or musical piece is understood. Either the author or the viewer can make repeated resemblances, binded cues, which bring memories or preceeding action, motives, melody from the viewer's mind; but the by-product (temporal neural pathway) can be only rarely established - therefore, only a few aesthetical feelings or appreciations occur during the performance. Most of the formulation of "value judgments" occur after the performance (within several hours until several days), and such judgments may be significantly influenced by the viewer's past experiences, education, memories (here the play also has a role in the shared experiences: gossip and talk about the show with other people, reviews from the press). So the forced retrieval (questionnaire about the concert, play) carries a vast mixture of primary and secondary impacts of the artwork.

Transmitted Delivery:

On the surface, the performed and transmitted delivery is similar: television programmes of theatre plays, ballets, or concerts should have some impact on the viewer, like in a theatre. Music from the radio should convey a similar impact to the listener as music performed life. This is only partially true. The transmitted delivery's lack of psychodramatic and psychosomatic aspects (sometimes poorly imitated by "canned laughter" in television studio shows - or better, by transmitting the noise in the auditorium before the concert to convey the environment of the performance).

Furthermore, there is the impact of media (size of screen, intensity and color parameters, cinematic movements of frame, inside the picture, screen or radio set information definition) and the impact of the environment (physical, lighting and human environment - of watching, listening, and of the programmes themselves).

The aesthetical impact in transmitted delivery suffers from rigid programming which allows (or does not allow on purpose) the viewer to have only a few reflections while watching the show. The information on the screen is so densely spaced and so diversified that the viewer is forced to skim much of the information in the pattern - and these patterns (not the programmes themselves) become a source of aesthetical impact. Startling conversions of content and formal phenomena occur: the villains may become heroes in the viewer's mind, the ugly situations start to be "beloved" ones; the mediocre-stereotyped actor may become a "star". We deal here with completely detached content or forms from the realities on celluoid and tape. The plays, actors, scenes, coincidences of sound and image only have an impact if they are performed at the right speed and succession (24 frames per second in film, 30 half-frames per second in television). Theorists dissecting the scenes of film or television programmes and analyzing it in isolation or different speeds may come to drastically different conclusions from those which reside in the mind of the viewers.

One situation, here, is an exception: hearing music or sound programmes on a record player or tape-recorder, or viewing the television programme from videocassettes. Here, the viewer/listener has a limited choice of replay or intermission. Although the structure of the artwork rarely permits many intermissions or dissections without the disturbance of content flow - this is possible and may be a source of important simulation process, one of the helping mechanisms of aesthetical impact. Such situations now occur in quantity with the increased use of audio-cassettes and portable players (in Canadian cultural statistics). The musical piece is now replayed 7-12 times more than before the mass utilization of audio-players (cassette tape-recorders, tape-recorders and record players. The"piped music" and "muzak" is another form of stimulation which is reflected in the cortical processing as stimulators. All these facts bring the transmitted delivery of the artwork back to the natural percpetual and processing rhythms of the listener, viewer.

V. THE ARTWORK'S STRUCTURES, AFFECTING THE FORMULATION OF AESTHETICAL IMPACTS

There are several basic structures through which information is formed for delivery to the receiver in the artwork. Each may have a different influence on the formulation of the aesthetical impact.

1. Dramatic structure

Here, I refer to the structure which (in a literary text, painting, musical piece) carefully builds a tension. This tension may or may not be released (catharsis in a dramatic play). Neurophysiologically, the cortical "tension" usually occurs when several information processing phases overlap either with external stimuli, or with internal information processing. The result is an information overload on part of the neuronal circuitry, and the reflection of such a state sends its by-product, vertical static waves, through the cortex and subcortical regions. In many cases, these waves influence the hypothalamic centrum of the brain (tensions associated with fears, rages), and may cause visible reactions on the viewer/reader (blushing, sweating). But such processes differ significantly from actual tensions which occur in daily life. By the perception of the artwork, a person always reflects the perceptual distance (the events in the drama do not touch the observer's own life), therefore, physiologically, the pituitary, thyroid and adrenal glands are rarely influenced.

There is a significant role of the artwork's temporal axis (how long the tension is built up in the artwork), which somehow much correspond to the viewer's/observer's time extent of his adaptation syndrome (after Selye). If the tension in the artwork occupies more than the first two phases of the syndrome (although the time may vary, this represents a sequence of around 3-5 minutes in film, or 8-12 minutes in the reading of a text), a person's body rejects further stimuli (the reader stops reading or the viewer's attention is distracted from the television set). This effect is very well known to film and television scriptwriters who mold the story into short "modules", each module with its own built-in tension and release.

Lack of tension in dramatic artwork has a very negative effect on the viewer - usually reflected in a shorter observation time, occasionally reported as "uninteresting drama", "... being turned off by the picture". The dramatic structure is an important helping element in the process of formulation of aesthetical impact: it may shorten the period, needed for the reflection or borderline effect of the temporal neural pathway.

2. Comedy, comic structures, laughter, jokes:

Here, I refer to the artwork's structure where specific incongruous relationships are established between places, persons and things, usually with a certain suddenness (timing) that leads the observer to laugh. (Incongruity being defined as "not harmonious, not conforming, inconsistent, lacking propriety). Many theorists of humor had precised such relationships in verbal terms (Berger as code violations: acceptable, non acceptable; Hobbes as superior and inferior situations; Bateson as roles of paradoxes-lies and truth self-contradictions; Fry: frameworks of reality and unreality; Freud: conscious-unconscious; Bergson: as mechanical or flexible). From the point of view of biocybernetics, the most important aspect of humor is not its own structure, but the effect, it causes in the brain's cortex. Through a humorous paradox, the tension (information overload) is built up very quickly to the point where logical, abstract decisions are impossible. The immediate release through a "joke" brings a state of equilibrium (and its by-product of hypothalamic command to the autonomic nerve system in our respiratory and vocal tract - laughter).

Humor has its own specific structure:

- elements (acts, actions, bits of story, or what structuralists might call a "jokeme");
- relationships (incongruity established as the "punch line", joke domain);
- release space (consequences of jokeme and relationships, cooling-down phase of a joke).

There are also four basic categories of humor:

- language (the humor is verbal);
- logic (the humor is ideational);
- identity (the humor is existential);
- action (the humor is physical).

Within these structures and categories, there are many techniques (more than 50-60) of humor.

Humor significantly helps the formulation of aesthetical impact by the quick return of cortical processes to the equilibrium stages, after short and stress build-ups - therefore enforcing the envelope of the temporal neural pathway - aesthetical appreciation. Sometimes, the humorous, joke content can be fixed in the long-term memory as an important stimulator for further retrievals of events or juxtaposition.

3. Poetry:

Here, we deal mostly with juxtaposition enhancements (of words, situations, actions). Psychophysiologically, the processing of "poetic" information of the cortex consists of:

- initial, fast build-up of tension;
- release of tension without too much specific firings;
- stress waves resulting from specific firings.

The formulation of an aesthetical impact may occur during all three stages, but most occurences will result from the stress wave effect. Poetic pieces (poems, literary texts, pictures, moods of action) are characterized by the high density of information domains (words, visual symbols, behavioral cues of the actor) - with occasional missing links (a poetic text may not contain full sentences, poetic action of the actor on stage may not correspond with the flow of the story, allowing the receiver's own cortical interactions).

The density of the information domains also release quick reflections, recollections in the mind of the viewer/reader - or trigger an avalanche of stress waves (emotional) responses. Substantially dense content/ideas may be delivered much quicker than in other structures of artworks.

4. Documentary

Here, I would like to mention not the direct, "rational" impact of the artwork which deals with the pieces or stories of realities, but the indirect impact reality that in the artwork has on the perceiver as a resulting psycho-sociólogic process. This may occur on several niveaux:

- association with reality (the perceiver "flows with" the film, story, book);
- acknowledgment of reality (the perceiver "knows" about the event, story through the artwork);
- judgment (resistance or acceptance)of reality (the perceiver values the event, story to his/her own inner world of experiences, memories, values).

From the association with reality, occasionally, aesthetic feelings may result. From the acknowledgment of reality (if reality deals with the themes of beauty, perfection, exceptionality), the aesthetic appreciation may result. The judgment of reality (especially when artifacts are involved), certain notions of aesthetical values may be constructed.

5. Epic:

Here, I would like to note that from the multitude of actions, story events or situations in the artwork, occasionally, a certain amount of aesthetical impact may occur.

These situtions occur less and less in current time, as the temporal axis of artworks and performance times are compressed, or information loads within the artwork are fused into patterns.

VI. AESTHETICAL PROFILES

If we compile amounts of data regarding the aesthetical impacts, the notion of certain groups, patterns can be labelled as an "aesthetical profile". Here, we can distinguish:

1. Aesthetical Profile of artworks
2. Aesthetical Profile of regions
3. Aesthetical Profile of audiences

Within the temporal and spatial axis, it can also be distinguished:

1. Horizontal axis of an aesthetical profile (extent of the influence of the artwork, region or audience group).
2. Vertical axis of an aesthetical profile (investigation of data into the history (from the origin of the artwork to contemporary time), and forecasts of the aesthetical impact of the artwork into the future (studies and ratings of pilots for films or television programmes).
3. Spatial axis of an aesthetical profile (the changes of an aesthetical profile across cultures, nations, regions, centuries ...)

An aesthetical profile may have a wide range of applications; it can serve the historicians of art as a helping aid to the structural, formal or semantic analysis and critiques of artworks, periods, authors; it can serve the decision-making people and institutions in the assessment of artworks, regions or needs of audiences; it can serve artists as possible comparisons for their own artworks or shared intuitive thinking before or by the creation of artworks; it can serve psychologists, sociologists and social workers (animateurs sociaux) for the assessments of the regions in cultural planning.

The biocybernetic aspect of an aesthetical impact is only one of many approaches to the aesthetical analysis and thinking. Speculative aesthetic schools, structural, semantic or semiotic analysis have their own merits and important places within aesthetic judgments. The approach described in this study was aimed at an area rarely explored in the field of aesthetics.

Dr. M.F. Malik

Proposal for research project:

"AESTHETICAL PROFILE"

IDEA:	To use current discoveries in biocybernetics to the investigation of aesthetical information impact of selected classical artworks (paintings, sculptures, historical buildings, open landscapes).
FORM:	Periodic biometric measurements of the information and aesthetical impact on the sample of observers, viewers (laymen and learned persons alike) in several environments (cities, museums, galleries, landscapes), in one or more countries.
INSTRUMENTATION:	Portable biometric laboratory with multi-channel data extraction and telemetric equipment, able to monitor the sample of 10-25 persons in the area of a gallery, library, historical building (2-3 km^2).
PROCESSING OF DATA:	The graphical records should be digitized and stored on disc memory for display retrievals. Pictorial records of observation should be stored for simultaneous comparative psychologic or psychometric tests.
DIAGNOSIS OF DATA:	The biometric data should be compared with several other methods of speculative, semantic or structural analysis of the same artworks, as well as with the observer's recalls (interviews, questionnaires).
RESULTS:	Results may comprise the possible aesthetical profile of the artwork, region or audience.

December 1978, Montreal.

BIBLIOGRAPHY

Adelson, L.	Time-compressed lectures: Comprehensions, pattern of comprehension..., ICA, Chicago 1977
Alland, A.	The artistic animal: an inquiry into the biological roots of Arts, Carden City, 1977
Allander, B.	It's not reality any more, Sveriges Radio, 1974
Argyle, M.	Eye Contact, Distance and Affiliation, Sociometry 28, 1965
Aristotle	The Poetics (English translation), London, 1927
Arnheim, R.	Art and visual perception, Berkeley, 1954
Arnheim, R.	Visual Thinking, Berkeley, 1969
Axelrod, J.	Neurotransmitters, Scientific American, 1976, Vol. 287, No. 4, pp 59-71
Bagby, J.A.	Some informational aspect of visual perception, Psycholigical Review, 1954, Vol. 61, pp 183-93
Bagdikian, B.	The Information Machines, Harper-Row, 1972
Barron, F.	Creative Person and Creative Process, New York, 1969
Belman, L.S.	John Dewey's Concept of Communication, ICA, Journal of Communication II, 1977, pp 29-37
Bense, M.	Theorie der Texte, Cologne, 1972
Bense, M.	Aesthetica, Baden-Baden, 1965
Bense, M., Maser, S.	Methodishe Grundlagen zur Analyse des subjektiven asthetischen Geschmacken, Cologne, 1974
Berger, A.A.	Anatomy of the Joke, Journal of Communication, Vol. 26, No. 3, pp 113-115
Bergstrom, S.S.	Movement, Sveriges Radio, 1974
Berlyne, D.E.	Aesthetics and Psychobiology, New York, 1971
Berlyne, D.E.	Pleasure, reward, preference, their nature, determinants, role in behaviour, New York, Academic, 1973
Bird, M.	A study in aesthetics, Cambridge, Harvard, 1932
Birkhoff, G.D.	Aesthetic Measure, Cambridge, 1933
Blaukopf, K.	The Influence of Electroacoustics on Pattern of Musical Behaviour, Ossiach, 1973
Bosanquet, B.	Three lectures on aesthetics, London, 1915
Bradac, J.J.	Diversity and density: Lexically determined evaluative and informational consequences of linguistic complexity, ICA, Berlin, 1977
Braitenberg, V.	Introduction into the Nervous Systems, Ossiach, 1977

Briggs, G., Swanson, S., Encoding, decoding and central functions in human information processing, Journal of Experimental Psychology, 1970, Vol. 86, No. 2, pp 296-308

Brown, E. The base of reading acquisition, Reading Research Quarterly, 1970, Vol. VI, No. 1, pp 49-74

Brown, L. World without Borders, Random House, 1972

Buckingham, H.W. Neologistic Jargon Aphasia, Neurolinguistic III, 1976

Burnham, J. The Structure of Art, New York, 1970

Campbell, F.W., Maffei, L., Contrast and Spatial Frequency, Scientific American, Vol. 231, No. 5, Nov. '74, pp 106-114

Cater, D. The Intellectual in Videoland, SR 5, 31, 1975 pp 12-20

Cohen, A. The Effects of TV Formats on Mental Skills, Jerusalem, ICA, Berlin, 1977

Condon, W.S., Ogston, W.G., A Segmentation of Behaviour, Journal of Psychiatric Research 5, 1967

Crosby, T. A Sign System Manual, New York, 1970

Cuddy, L. Perception of Structured Melodic Sequences, IRCAM, Paris, 1977

deJonge, D. Applied Hodology, Landscape 2, 1977, pp 10-12

Dewey, J. Art as Experience, New York, 1934

Earley, K. The Voice of Neanderthal, Sciences, Vol. 15, No. 2, March 1975, pp 11-16

Eckman, P. Movements with precise meanings, Journal of Communication, Vol. 26, No. 3, pp 14-26

Ehrenfels, C. Kosmogonie, Jena, 1916

Ellul, J. Propaganda: The Formation of Men's Attitudes, New York, 1965

Fabun, D. Communication: The Transfer of Meaning, Glencoe Press, California, 1960

Findahl, O., Hoijer, B., Fragments of Reality, Sveriges Radio, Stockholm, 1976

Fletcher, J.E. Attention, Retention, Meaning and Popular Music, University of Georgia, 1975

Forester, J.W. Principles of Systems, Cambridge, 1972

Forester, J.W. World Dynamics, Cambridge, 1971

Freeman, F.N. Visual Education, Chicago, 1924

Fucks, W. Nach Allen Regeln der Kunst, Stuttgart, 1968

Gabor, D. The Mature Society, London, 1972

Gevins, A.S. Automated Analysis of the Electrical Activity of the Human Brain, Proceedings of IEEE, Vol. 63, No. 10, October 1975, pp 1382-1413

Glassman, R.B. Persistence and Loose Coupling in Living Systems, Behavioural Science 18, 1973

Goldstein, J.H. Theoretical Notes on Humor, Journal of Communication, Vol. 26, No. 3, pp 104-112

Gotheil, E. The Measurement of Shape Constancy, American Journal of Psychology, 1951, Vol. 63, pp 406-408

Gunzenhauser, R. Aesthetiches Mass und aesthetische Information Quickborn, 1962

Haber, N.H. How We Remeber What We See, Scientific American 5, 1970, pp 104-112

Hahn, L. A Contextualist theory of Perception, Berkeley, 1942

Haley, J. The Appeal of Motion, Quarterly of Film Radio and TV, 1952, pp 361-374

Hall, C.A., Lindzey, G., Theories of Personality, New York, 1957

Hammond, D.R., Summers, D.A., Cognitive dependence on linear and non-linear cues, Psychological Review, 1965, Vol. 72, pp 215-224

Hansen, W. Patterns of Discovery, Cambridge, 1961

Harrington, J. The Rhetoric of Film, New York, 1973

Hawkins, G. Black Humor: Toward Contemporary model for joking interaction, ICA, Chicago, 1978

Heisenberg, W. Physics and Philosophy, New York, 1962

Herbener, G. The Idea of Aesthetics, BEA, Las Vegas, 1978

Hoving, K.L. Recognition reaction time and size of the memory set, Phychonomic Sciences, Vol. 21, 1970, pp 247-248

Hsia, H.J. The Information Processing Capacity of Modality and and Channel Performance , A-V Review, Vol. 19, No. 1, Spring 1971, pp 51-75

Huaco, G.A. The Sociology of Film Art, New York, 1965

Hunt, B.R. Digital Image Processing, IEEE Proceedings, Vol. 63, No. 4, April 1975, pp 693-708

Ivins, W. Art and Geometry: Study in space intuitions, New York, 1946

Jacobson, R. Verbal Communication, Scientific American, 1976

Johanson, G. Visual Motion Perception, Scientific American, Vol. 231, No. 5, November 1974, pp 76-87

Jowett, G.S. Communications in History, Windsor, 1975

Kaplan, A. The Conduct of Inquiry: Methodology for behavioural science, Seranton, 1964

Kaplan, R. On the notion of contrastive rhetoric, Sociolinguist Newsletter, No. 24, May 1977

Kendon, A.	Some relationships Between Body Motion and Speech, New York, 1972
Kennedy, J.M.	On the Evaluation of a Film, Toronto, 1974
King, B., Sutro, P.	Dynamic Visual Fields, Urbana, 1957
Korzenny, F.	A Theory of Electronic Propinquity, ICA, Berlin, 1977
Krampen, M.	Some Other Theories of Perception, New York, 1958
Kreütler, H.S.	Psychology of the Arts, Durham, North Carolina, 1972
Kuhn, T.	The structure of scientific revolution, Chicago, 1970
Lamontagne, C.	Where Fundamental Psychology meets Computer Science, Concordia University, 1977
Langfeld, H.	The aesthetic attitude, New York, 1920
Lashbrook, V.J.	Facilitate Strategies for Processing Oral Messages, ICA, Berlin, 1977
Latner, J.	The Gestalt Therapy Book, New York, 1973
Lebrun, Y.	The Artificial Larynx, Neurolinguistics I, 1976
Lebrun, Y., Hoops, R.	Intelligence and Aphasia, Neurolinguistics II, 1976
Leeuwenberg, E.L.	Structural Information of Visual Patterns, Paris, 1973
Le Guyader, H., Lafreniere, L.,	New Approach toward description of Living Systems, Paris, 1978
Levelthal, H.	A Process Model of Humor Judgement, Journal of Communication, Vol. 26, No. 3, pp 190-204
Llewellyn, T.E.	The Movement of Eye, Scientific American, August 1968, pp 88-95
Lundin, W.H.	Projective Movement Sequences, Journal of Consulting Psychologists, 1949, Vol. 13
Luria, A.R.	Neuropsychological Studies in Aphasia, Neurolinguistics, 1977
Mackworth, J.F.	Vigilance and Attention, Middlesex, England, 1970
Malik, M.F.	Dessins de l'Information, Radio Canada, Montréal, 1976
Malik, M.F.	Communication Analysis of Sound Information Complexes, ICA, Chicago, 1978
Malik, M.F.	Videophysiology, Journal of the UFA, XXX, 4, 1978 pp 9-13
Malik, M.F.	Basics of Creativity, University of Concordia, 1978
Malik, M.F.	Biometric Measurements of Perceived Sound Information, Ossiach, 1977

Malmo, R.B.	Physiological Study of Personal Interaction, Psychosomatic Medicine, Vol. 19, 1957
Mandelker, D.R.	Graphics, Concept and a System, Washington, 1975
Marek, J.	Information, Perception and Social Context, Human Relations Journal, 1963, Vol. 16, pp 209-231
Marko, H.	The Bidirectional Communication Theory - A Generalisation of Information Theory, IEEE Transactions on Communications, 1953
Marko, H.	Space Distortion and Decomposition Theory, Kybernetik, Vol. 13, 1973, pp 132-143
Marko, H.	Causality and Information, Darmstadt, 1975
Marko, H.	A Biological Approach to Pattern Recognition, IEEE Transactions, Vol. SMC, No. 1, January 1974
Marko, H.	Methoden der Kybernetik, Biophysik, Berlin, 1977
Maser, S.	Numerische Aesthetik, Stuttgart, 1972
Maser, S.	Uber eine mogliche Prazisierund der Beschreibung Aesthetische Zustande, Quickborn, 1967
Masini, E.	Space for Man, Roma, 1972
Maslow, A.H., Mintz, N.L.,	Effects of Esthetic Surroundings, Journal of Psychology, Vol. 41, 1956, pp 247-254
Meyer, J.	Acoustics and the Performance of Music, Frankfurt, 1977
Miller, A.G.	The Psychology of Communication, New York, 1967
Milner, P.	A Model for Visual Shape Recognition, Psychology Review XI, 1974
Minkkinen, S.	The Effect of the Text Background on the Readability of TV Text, Ylesradio, Helsinki, 1977
Moles, A.	Information Theory and Esthetic Perception, University of Illinois Press, 1966
Monson, M.	A Design for Interactive Audio, Wisconsin, 1975
McBride, M.G.	Social Proximity Effects on GSR in Adult Humans, Journal of Psychology, Vol. 61, 1965, pp 153-157
McHale, J.	The Changing Information Environment, A selective Topography Ekistics, Vol. 35, No. 211, 1973
McLean, E.	Emotion in Music, Musicology, March 1976, Vol. 2, pp 3-4
McLuhan, M.	The Gutenberg Galaxy, Toronto, 1962
McQuail, D.	The Audience for Television Plays, Urbana, Illinois, 1970
Neiser, U.	Cognitive Psychology, New York, 1967

Nichols, K.A. — Eye Gaze and GSR, Journal Experimental Social Psychology, Vol. 7, 1971, pp 623-626

Ollerenshaw, R. — Design for Projection: A study of Legibility, London, 1961

Patterson, B. — Musical Dynamics, Scientific American, Vol. 231, No. 5, November 1974, pp 78-91

Pepper, S. — Aesthetic Quality, a Contextualist Theory of Beauty, New York, 1937

Perls, F. — Ego, Hunger and Agression, New York, 1969

Piaget, J. — The Construct of Reality in the Child, New York, 1964

Pickford, R. — Psychology and Visual Aesthetics, London, 1972

Poliakin, M. — La determination des elements de base dans l'amenagement du territoire, Namur, 1977

Rakowski, A. — Structure of Musical Sounds, Ossiach, 1977

Reutsch, J — Non-verbal Communication, Berkeley, 1964

Revel, J.F. — Without Marx or Jesus, Doubleday, 1971

Rodes, S. — An Approach to Feedback Research Based on the Systems Theory Principle of Entrophy, ICA, Chicago, 1978

Rohm, C.E.T. — An Experimental Study of the Effects of Electro-myographic Biofeedback Conditioning on Verbal Decision-making Behaviour, ICA, Chicago, 1978

Ross, D.T. — Software Engineering: Process, Principles, Goals, Computer, May 1975, pp 17-37

Ruhl, M. — Systemdenken und Komunikationwissenschaft, Publizistik, Vol. 2, 1969, pp 185-205

Ruskin, J. — Lecture on Art, London, 1875

Salomon, G. — The Language of Media and the Cultivation of Mental Skills, ICA, Chicago, 1978

Santayana, G. — The sense of beauty: Being the outlines of aesthetic theory, New York, 1896

Schafer, R.W., Rabiner, L.R., Digital Representation of Speech Signals, Proceedings of IEEE, Vol. 63, No. 4, April 1974, pp 662-702

Schlater, J. — Effect of Speed of Presentation and Irrelevant Cues on Recall of Television Messages, Dissertation, Urbana, 1967

Schroeder, M.R. — Models of Hearing, Proceedings of IEEE, Vol. 63, No. 9, September 1975, pp 1332-1349

Schultiz, H. — The Message as an Architectural Medium, Architectural Forum, Vol. 132, No. 4, 1970, pp 44-49

Schwartz, B.	Human Connection and the New Media, New Jersey, 1973
Schwartz, T.	The Responsive Chord, Garden City, 1973
Shannon, C.E.	A Mathematical Theory of Communication, Bell System Technical Journal 27, 1948, pp 379-423
Shedletsky, L.J.	Memory-scanning of a complex sentence just heard, ICA, Berlin, 1977
Sohn, D.	Film: The Creative Eye, Dayton, Ohio, 1970
Spache, G.D.	Ed.: Reading Disability and Perception, Proceedings of XIII International Reading Association Convention
Strang, R.	Reading Diagnosis and Remediation, ERIC/CRIER, 1968
Tanner, O.	Stress, New York, 1976
Taylor, I.A.	Perception and Design, New York, 1961
Teilhard de Chardin	The Phenomenon of Man, New York, 1959
Terhardt, E.	Psychoacoustic Evaluation of Musical Sounds, Ossiach, 1977
Teuber, M.L.	Sources of Ambiguity in the Prints of M. Escher, Scientific American, Vol. 231, No. 1, July 1974, pp 90-104
Thiel, P.	Notes on the Description, Scaling, Notation and Scoring of some perceptual and cognitive attributes of the physical environments, MIT thesis, 1962
Tunnard, C.	Vision in Motion, New Haven, Yale, 1963
Ward, B.	Nationalism and the Ideology, New York, 1971
Westlin, A.	Information Technology in a Democracy, Harvard, 1971
White, N.	Ethology and Psychiatry, Toronto, 1974
Wickenden, T.	Information and Optimisation, ICA, Chicago, 1978
Wurtman, R.J.	The Effects of Light on the Human Body, Scientific American, Vol. 233, No. 1, July 1975, pp 69-77
Zettl, H.	Sight, Sound, Motion, Belmont, California, 1973
Zettl, H.	The Study of Television Aesthetics, Journal of Broadcasting, Vol. II, 1968, pp 36-40
Zettl, H.	Toward a Multi-Screen Television Aesthetic: Some Structural Considerations, Journal of Broadcasting, Vol. 21, No. 1, Winter 1977, pp 5-19
Zhelev, T.	Aesthetic Activity in the Age of Mass Media, IMDT 4, 1978